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JOURNAL OF SCIENCE.

JANUARY, 1883.

I. SPEECH IN ANIMALS.

THE languages in which animals converse more or less definitely with other individuals of their own, or of nearly allied, species, were discussed in the "Journal of Science" some years ago (1875, p. 68). The conclusion reached was unfavourable to the common egoïstic notion that speech is the exclusive prerogative of man. That conclusion we are still free to uphold. We regret however that, so far as we are aware, no one has undertaken a formal study of these animal tongues, so as to converse with any of our "poor relations" in their own language.

Commending this subject to the attention of such persons as have the needful time and the opportunities at their command, we wish now to examine the attempts of certain of the lower animals to acquire human speech.

It seems at first sight curious that these attempts have been made with the greatest success, not by the mammalian groups which rank physiologically and psychologically nearest to us,—such as the apes and the Carnivora,—but by certain birds. But we must remember that a number of attributes must coexist in any animal before it can be capable of speech. In the first place, its vocal organs—especially the tongue, the glottis, and the pharynx—must be constructed in a manner equivalent to, if not identical with, the same parts in man. Secondly, there must be a sufficient degree of general intelligence. The animal must be capable of remembering sounds, of perceiving the differences between them, and of connecting them with objects, events, wants, &c. In addition there must be an especial development of

those parts of the brain which control and regulate the action of the vocal organs. This development, it is scarcely needful to say, is most likely to be met with among gregarious species which require and possess a tolerably complete language of their own.

But there is still a further condition: an animal before it can be expected to learn human speech must be brought into close and friendly intercourse with man. The impossibility, or at least the difficulty, of such intercourse, especially in those countries where experiments of this kind have been generally attempted, is a most serious obstacle. Another kindred drawback is that many of the most promising animals do not—in Europe at least—breed in captivity, and are thus withdrawn from hereditary influence and from a selective development carried on through a number of generations.

As regards the birds which have hitherto acquired some knowledge and command of human speech, there prevails a difference of opinion. The question arises, Do they understand the sounds they remember and repeat, and use them with a due regard to their meaning; or do they reproduce words in the same manner as does a human mimic when imitating the squeak of a pig or the quack of a duck, without any knowledge of or care for signification? The latter is the current opinion. It is maintained that every appropriate, and especially every witty, thing said by a parrot is a mere coincidence. But this view admits of an easy and complete refutation. We ask, Is the bird in the habit of repeating the happy phrases which figure in popular anecdotes, in season and out of season? If so, we might admit that "Polly" speaks merely by rote, and without understanding. But there is good evidence to show that parrots can and do connect their utterances with certain objects, events, times, and other circumstances, and do not therefore speak simply at random. Of this the following cases, for which we can personally vouch, will serve as proof:—A parrot whenever she saw any food being prepared or consumed invariably cried "Give Polly a bit, if you please!"—an exclamation which she was never known to utter on any other occasion. Another was accustomed to have her cage covered over with a shawl at roosting-time, in order to shut out the gaslight: if this was forgotten the parrot cried out very emphatically "Polly wants to go to bed!" This speech she was never known to utter at any other time. A magpie, which belonged to a neighbour of ours at Stowmarket, learnt, without any instruction, the names of several

members of the writer's family, rarely failing to utter them on sight of their bearers, but never pronounced them at any other time.

The following case, communicated by M. l'Abbé Gras to "Cosmos les Mondes" (Oct. 21, 1882, p. 297), refers to an African grey parrot which was at first very wild and timid, and which M. Gras has kept for four years in company with a green Brazilian parrot, which was previously very tame, though less intelligent. He names the grey parrot Coco and the green one Cocotte. When being put back into the cage, Coco calls out "We are going to the cage." If a supply of seeds is given her, she says "Here is something good." When swinging, she cries "Coco is swinging." If her companion screams, she says "Come, Cocotte, don't scream; sing!" If Cocotte sings, Coco exclaims "You sing well; oh, very well!" The two birds were walking in the dining-room, and Cocotte began to sing; Coco said "Some one is singing." When asked "Who is singing?" she answered "Cocotte." The latter bird on one occasion went under the sideboard, when Coco, looking down, cried "What are you doing there, Cocotte?" M. Gras was giving some directions to his housekeeper, when Coco exclaimed "How, don't you understand?" The worthy Abbé vouches for the exact truth of all the above facts, and adds that he has numerous witnesses who can corroborate what he asserts.

These and many other authentic cases which are on record, but which it is not necessary here to repeat, show that such birds attach a definite meaning to certain phrases, and use them just as do we human beings. The contention may still, however, be raised that such birds do not understand the individual words, but merely the phrase or sentence as a whole.

Supposing, however, that this is the case, we must admit that such is the precise manner in which human children acquire the knowledge and use of language. The child learns a phrase as a whole, connects it with the object or occasion to which it is appropriate, but does not for some time resolve it into its component parts and employ these in new combinations. But we have observed that intelligent parrots do occasionally vary their stock phrases by fitting in additional words or leaving out some of the old ones. Thus a parrot belonging to the present writer one day saluted a lady visitor with "Good morning, duckey!"—a combination which the bird had never heard.

Another interesting point of comparison here appears

between young children and parrots. Talking birds, as far as we are aware, never speak in the first person. The parrot, addressed as "Polly," speaks of itself as "Polly"—that word being the symbol for its own personality. But this holds good of young children also. The child always accosted as "Baby" speaks of itself as "Baby," using the third person instead of, as in after life, the first; or, in other words, the child uses its own name instead of "I" or "me."

There is yet a further similarity: a parrot, when trying to learn a new phrase, often blunders, especially about the last word or words. That of the present writer's, above referred to, was lately studying the phrase "Who's a rogue?" For a couple of days she repeated "Who's a — Who's a who — ?" till at last the final word got fixed in her memory, and she ejaculated "Who's a rogue?" with great emphasis. Something closely alike is traced in young children when learning to talk; they also bungle and break down over the latter portion of a phrase, and, when it is fully mastered, use it for a time both in and out of season.

Thus it would appear that, as far as the use of language is concerned, the intellect of an African grey parrot is on a level with that of a child about eighteen months of age.

We are often asked, ih reference to this point, Why does the child continue to acquire greater powers of language, to retain a greater number of words, and to combine them as occasion requires, whilst the parrot soon comes to the close of its literary education? The answer, surely, is not far to seek: the child is descended from hundreds, perhaps thousands, of generations of talking animals, and inherits the gradually accumulated aptitudes of its forefathers. Merely, however, let us remember, the aptitudes, for the child brought up apart from human society does not inherit articulate speech.

With the parrot the case is totally different: she inherits merely the tendency to scream and whistle, and, as far as language is concerned, she is a sheer parvenu who has risen by her own exertions, without any ancestral resources.

We know of no case of an African grey parrot (*Psittacus erythacus*) having reproduced its species in Europe.* Were this to be done the young birds would doubtless be feeble, and die out. But the experiment might be tried with this species, say at Madeira, or in some locality not too inimical

* A bird of this kind belonging to a contributor of the "Journal of Science" laid two eggs last summer.

to civilised man. Or it might be attempted in temperate South America with *Chrysotis amazonica*, which is said to be even more docile and intelligent than the African grey parrot. If a pair of clever parrots were matched, and the experiment were carried on for several generations with their offspring, always selecting the most docile and intelligent birds, there can be little doubt but that most interesting results would be reached. The adaptability of the vocal organs to articulate speech, the power of the brain to regulate and co-ordinate the action of the muscles of those parts, would assuredly undergo a gradual development. In like manner the memory for words, and for their connection with the objects which they symbolise, would be strengthened. What ultimate end might thus be reached it is impossible to predict. Perhaps in these days of cram and of the equal rights of animals we may, in five centuries, have magpies in the "fifth and sixth standards," macaws preparing for the examination of the Science and Art Department, and cockatoos—"sweet *bird* graduates"—taking their degrees at the University of London.

(A cantankerous acquaintance who sometimes intrudes into our sanctum, looking over our shoulder, remarks that we have already reached all these results.)

In sober sadness we trust that such experiments will be carefully undertaken and carried on for the needful length of time. Of time, indeed, there must be no stint, for parrots arrive but very slowly at maturity.

So much, then, for birds. But how about talking Mammalia? We can scarcely deny that the anthropoid apes, the dog, the cat, the elephant are more intelligent than the parrots, ravens, magpies, starlings, &c. It is generally admitted that they understand our spoken language to a very considerable extent, even in matters where tone, gesture, or expression of features throw no light at all upon our meaning. We know instances where words of reproach, though intentionally uttered in a mild tone, have been at once comprehended both by dogs and cats.

A very intelligent dog described by M. A. Roujon* will, when ordered by his master, fetch, without ever being mistaken, his pipe, tobacco, a knife, a fork, &c. When he hears merely the word "sport" (*chasse*) he rushes to his master's gun. This dog belongs to a M. Antoine Barthomeuf, who keeps a café in the Place de l'Eglise, at Chamalières, near Clermont-Ferrand. But why, then, as mammalians so

* Revue Internationale des Sciences Biologiques, 1882, No. 10, p. 348.

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clearly understand and remember our language, are they so little capable of acquiring its use? We will admit that it is, for the majority of men, easier to understand a language than to speak it. But this well-known fact is far from explaining the difficulty. Does it lie in the different structure of the vocal organs? This difference in the higher apes is but trifling. In the Carnivora it is greater; their tongues are relatively longer and slenderer, and better adapted for lapping up liquids, or for licking and rasping the bones of their prey, than for going through the various evolutions within the mouth required for the production of articulate sounds. The voice of the cat is deficient in compass, and that of the dog is too abrupt and jerky. The anthropoid apes, though given to converse among themselves with great volubility, have never been brought sufficiently long and closely under human influence; they have never been known to propagate in a domestic condition, and their lives in captivity in Europe or in the United States are short and sad, since they are soon attacked by disease. Hence the opportunities for teaching them to talk have been insufficient. We should suggest that the attempt should be made, say at Calcutta, or Buitenzorg in Java, with the mias or the chimpanzee, just as we have suggested above in case of the parrots. The difficulty would be how to give these animals the freedom necessary for their health and vigour, and yet to bring them in sufficiently close contact with their keepers. We should propose that the course of training should commence with pregnant females. The young should then be brought from infancy into the society of kind and intelligent keepers, who should teach them to speak, those which showed the greatest aptitude being selected as the parents of the next generation.

Meantime it must not be forgotten that there are some Mammalia which have, in rare instances, been known to utter a few words. Among these is the common seal,—a singularly docile, affectionate, and intelligent creature, which might well claim at the hands of man a better treatment than to be massacred for the sake of its fur.

There have been various anecdotes of talking dogs, but the only instance which is duly authenticated is that of the dog of Clermont-Ferrand, above mentioned. This dog, a setter, can, according to M. Roujon, utter the words "*ma maman*." "To make the dog speak," says this author, "it is necessary to stand before him and bid him pronounce the words *ma maman*, showing him some bread or meat. The dog then becomes agitated and growls, but on repeating the

demand he at length decides to speak. He pronounces at first feebly and indistinctly, but on telling him to speak more distinctly he gradually finds his voice, and finally pronounces the words demanded very distinctly." This performance, we learn, has been repeated before a great number of persons at Clermont. The same dog, further, if his master has shot and brought home any game, runs of his own accord to the kitchen to seek a knife, carries it to his mistress, and addresses her as *ma maman*.

MM. Gallois and Gory, friends of M. Roujon, state that they have met with several dogs who pronounce distinctly some words,—amongst others the word *non*. It is indisputable, as M. Roujon remarks, that by applying to such animals a methodic selection prodigious results may be obtained. Prof. Max Müller's "Rubicon" may be dried up in a manner plain even to the most prejudiced.

II. PATENT-LAW AMENDMENT.

By An Old Technologist.

FOR some dozen years or more we have, as a nation, come to the very wise conclusion that the Patent Law of the United Kingdom is not all that might reasonably be demanded, and that, in well-known phraseology, "something ought to be done." What that something is and who is to do it are further points upon which we are by no means agreed. It is, in the first place, to be regretted that neither of the great political parties seem willing to take the matter heartily up. Precisely because it is everybody's business it is nobody's. Hence while questions which are in comparison light as air—or rather as hydrogen gas—can secure the attention of the Administration and of Parliament, Patent-Law reform is shelved,—put off to some indefinite epoch. That this should be so is discreditable to our national prudence and common sense. Without a good Patent Law we shall have no inventions and improvements, and without inventions and improvements we cannot hope to hold our own in the intensified struggle for business which

is so characteristic of modern times. A statesman of the present day has openly expressed his satisfaction that we have no longer a monopoly of the world's manufactures. Will he and his friends, then, do nothing to place us at least on terms of fair equality with our rivals? Or are we to go on, as we are at present, heavily handicapped in the race?

But though Parliament has done nothing, and does not for the present seem likely to do anything, certain societies have taken the matter up, and have expressed opinions which will not be without influence upon the nation, and in due time upon the Government. Among these may be noticed the Philosophical Society of Glasgow, and the Society of Arts, which has taken the trouble to draft a Bill to be introduced into Parliament if that august body has ever time for the consideration of so plain and matter-of-fact a subject.

More recently the Council of the Society of Chemical Industry has resolved upon certain "recommendations," which have been widely circulated and which are influentially supported.

It may, perhaps, seem presumptuous for a mere private individual, holding no official position, to dissent from opinions put forward by such high authorities, and to proclaim their recommendations unsatisfactory; yet I feel compelled so to do, and I can only hope that the grave importance of the subject may be accepted as an excuse for the liberty I am about to take.

In the first place it must be asked, What do we aim at by a new and improved Patent Law? Do we seek to encourage and attract invention, or to drive it away? On the answer to this question the character of the recommendations to be proposed, and of the law to be enacted, must hinge. If we have the former purpose in view,—if we wish that invention should abound and flourish among us, that our working-men in every department of industry should be constantly seeking to improve the processes now in use, and that foreign inventors should flock to England as the best sphere for the practical carrying out of their ideas,—we must seek to give greater facilities for protecting the property of the inventor in the work of his own brain than he can meet with elsewhere. This is not the case at present. And we must venture to remind those cynical freebooters who tell us that the inventor will go on inventing whether we protect him or rob him, that if he finds himself robbed he may carry his future inventions elsewhere.

A regard to our own future, an enlightened self-interest,—

leaving equity out of the question,—bids us therefore see to it, that the inventor is not compelled to go elsewhere.

What is needful for this purpose? We must grant patents for a longer term than do our rivals; we must grant them on easy terms as to fees and duties; and, above all things, we must secure for patents once granted an absolute duration. In all these points we offer less instead of greater facilities to invention than do some of our industrial rivals. Let us take the most formidable of these rivals, the United States of America. In that country the property of the inventor in his ideas is secured for seventeen years, whilst we grant him only fourteen years. Secondly, the expense of taking out a patent is, as is perfectly well known, a mere fraction of the charges incurred in this country. But the most important point in favour of the system of patents of the United States is what I must call its certainty or fixity. A. B. has invented, say, a new method of manufacturing soap; he has paid his fees, and received the official document certifying his rights. From that moment to the expiry of the seventeen years the patent is his absolute property, unless of course it is set aside by the decision of a Court as being wanting in novelty, or as being an infringement of some prior patent. No act or omission on the part of the patentee can render his patent null and void. In the United Kingdom a totally different system prevails, to the disadvantage of the inventor. He is called upon to pay £50 at the end of the third year, and a further sum of £100 at the expiry of the seventh year, failing either of which sums the patent is forthwith void, and the invention becomes public property. Now the effects of such a system are self-evident. Every person who wishes to have the use of the process, and who otherwise would negotiate with the patentee for a license or for the purchase of his entire rights, is induced to wait, in the hope that the patentee may fail to pay the £50 duty at the end of the third year. This is especially certain if the inventor is known or suspected to be poor,—a state of things far from uncommon, as his means are often much reduced by the cost of perhaps a prolonged course of experimentation. Hence, therefore, capitalists have a distinct inducement given them to hold back, which in America does not exist.

Now it has always been a mystery to me how it comes that genuine Patent-Law reformers—men who declare themselves the friends and promoters of invention—do not perceive the necessary effects of this system of intermediate payments. So far are they, however, from recognising the

truth of this consideration, these payments—modified perhaps in date or in amount—are retained in almost every suggested scheme for a new Patent Law. Nay, in one proposal, which would have lengthened the lifetime of a patent to twenty-one years, a *third* intermediate payment was adopted, thus giving the patent three chances of lapsing.

In the abortive Patent Bills introduced by the late Ministry, and fortunately withdrawn, there was a clause which seemed to me particularly objectionable and dangerous. It was proposed that if any patent had not been brought into use on the large scale by a fixed term of its career, it should forthwith lapse and become public property. Such a proposal did not appear surprising in Bills which were, almost avowedly, drawn up on the assumption that patent-right is an abuse and a nuisance,—a "monopoly," as some call it, in flat contradiction to the authoritative definition of monopolies laid down by Coke,—to be curtailed as much as possible. But the public may well think it strange to find the same suggestion put forward among the recommendations of the Society of Chemical Industry. They propose, namely, that if a patent has not been brought into operation upon a large scale by the fourth year it is to lapse, the invention of course then becoming public property!

There are certain plausible considerations which have led to this proposal, which is a too literal carrying out of the saying "From him that hath not shall be taken away even that which he hath." Its supporters will doubtless argue that if a patent has not been brought into extensive use on the large scale within the very short time specified, it must be practically valueless, and may consequently be cancelled without injury to the patentee, and with benefit to the community at large, who may then at leisure avail themselves of any useful feature it may possess. Such considerations on a close examination, undertaken with an eye to equity, soon show themselves to be fallacious. It is certain that the eagerness of the public to avail themselves of a patented process bears no direct proportion to its utility. We do not find that a patentee is, as soon as his letters patent are duly sealed, overwhelmed with applications for licenses or with offers to buy the whole or a portion of his rights. Quite the contrary; he is obliged to go out and seek to bring his improvement under notice. He must go round like a traveller seeking for orders. He must exhibit and read papers, and correspond. Now all this requires abundant time, thorough business tact, and plenty of money. Is the Council of the Society of Chemical Industry prepared to assert that an

invention is valueless unless the inventor possesses these three properties? As the Law stands it may safely be asserted that if a patent comes into extensive use by its seventh year the inventor may think himself fortunate. The only exceptions to this rule are when he is a capitalist, or has the ear of some capitalist or syndicate who may be willing to put the new process in operation.

Such, I say, is the case as the Law now stands. But if the proviso which I am criticising be incorporated in the proposed new Act the case of the patentee will be infinitely worse. It will then be impossible for a poor man, or for one who is not a man of business, to hold a patent beyond the fourth year. The manufacturers and others concerned will say, as they now say with reference to the third year's stamp-duty, "Don't pay license to this troublesome fellow, but wait till his rights lapse." They will be able to say this with more confidence, for it is often much easier to raise the £50 for the third year's tax than to force an invention into use in the face of a conspiracy of neglect. Consequently, if this extraordinary proposal becomes Law, it will be an act of folly in anyone not a capitalist, or enjoying exceptional facilities, to take out a British patent at all. If he devises anything useful, I should in that case recommend him to carry his idea to America, where he will meet with a more liberal, and I will venture to add a more honest, treatment.

Summing up this part of the patent question, it may be said that to declare a patent at an end if not taken up within a certain time is to ensure that it will not be taken up.

There is, however, one particular case in which the liability of a patent to determine, unless put in practice on the large scale, might be usefully, and I believe justly, introduced. It is well known that the original object of patents was the introduction of new arts into these realms, and the improvement of those already therein existing. This becomes perfectly clear if we read over the preambles of some of the older patents. But as the Law now stands, and as it is now worked, it is made the instrument of keeping certain arts *out* of Britain. It is very common for aliens to take out a British patent, not with the intention of working it on British soil, but of preventing anyone else from so doing. They either refuse to grant licenses at all, or they demand royalties which are practically prohibitive. Now it would be prudent to decree that if an alien takes out a patent in Britain, and in some other country, and works it in such other country but not in Britain, his British

patent shall then lapse. It might be well to add that if a British patent exists for the manufacture of any article, the importation of such article from abroad shall be prohibited.

There is another defect in the present Patent Law which is very objectionable, but which, singularly enough, is quite overlooked by the various bodies who have issued proposals for its amendment. Our present system is in one respect a step backwards from what is known as the "Old Law." Separate patents were indeed required for England, Ireland, and Scotland; but the English patent, on payment of a small additional fee, covered "all her Majesty's possessions and plantations abroad." I have never seen any reason, or shadow of a reason, why this Imperial scope of a patent was abolished. It was once said, in an off-hand manner, when the subject was mentioned in Parliament, "Oh, the Colonies have got their own Patent-systems." Precisely; and this is the very evil complained of. If an inventor wishes to have his invention protected throughout the whole British Empire he has to pay altogether about £1200. Now it is not within the power of the Imperial Parliament to extend the hoped-for new law to those colonies which have quasi-independent legislatures. But India and the remaining colonies might be included with the home kingdoms. Nor do I think that Canada, Victoria, New South Wales, &c., would object to come in, since their Patent Offices would then—like that of London—have the power of granting Imperial patents, which would obviously be of much more value to inventors than the present local ones.

There is a further innovation which I venture to think would be of great public utility. Following the wise example of Germany, we ought to exclude proprietary medicines, foods, beverages, and substitutes for foods from the benefits of the Patent Law. By so doing we should strike a deadly blow at quackery, and at various phases of fraud and adulteration.

III. ON ANTHROPOLOGICAL FORECASTS.

By F. RAM.

ARE Darwinian principles to be set aside whenever the future of mankind forms the subject of philosophical speculation; or is the theory that all organised beings are fashioned by the environment—a theory now generally admitted to be true as regards the development of our species hitherto—to be considered to hold good for the bimane of the future also? No Evolutionist would, I suppose, maintain in so many words that there exists an immutable destiny, which will of necessity exalt generations to come into a higher rank—mental, moral, and physical—than man now holds, whether the circumstances which beset our race are favourable to such desirable amelioration or are antagonistic to it; and yet how many anthropologists, when dealing with the subject, appear to be led by their optimistic prepossessions into a practical abandonment of the theory that the direction of development is dependent on the conditions of life. The lesser lights do, indeed, follow high authority in thus sacrificing (as it appears to me) scientific principles to philanthropical aspirations, for we find Mr. Herbert Spencer expressing his undoubting confidence that "the things we call evil and immorality will disappear," and that man must "become perfect;" * whilst by Mr. Wallace we have been assured that, of the race which will some day people the earth, no individual "will be inferior to the noblest specimens of existing humanity."† But surely, so long as we cannot demonstrate beyond dispute what the conditions of life will be in the time to come, and can show from the experience of the past that such conditions invariably produce such and such results, the confident anticipations of this description which one so frequently meets with must be held to be most unscientific, being born of faith and hope only, and resting on no sure foundation.

If two codes of ethics—a superior code A and an inferior code B—were placed before a philosopher of the optimistic school, and he were asked which he supposed would ultimately prevail in the earth, he would give his confident

* Social Statics, Chapter I., "On the Evanescence of Evil."
† Anthropological Journal, March 1, 1864, p. clvii.

decision in favour of the higher code. And this, indeed, he might very reasonably do, if he could first prove that the future environment must of necessity be such that those persons whose innate disposition most readily led them to accept and to follow its excellent precepts would multiply more rapidly than the baser sort of men, prone to reject them in favour of those maxims of the lower code which, by natural bias, they prefer and adopt as their guide in life. But should the conditions of human existence become such that the lovers of B code multiply faster than the lovers of code A, how then?

Why have not the noblest ethics, which have been proclaimed in the world for thousands of years, become practically operative in the lands in which they have been taught? Is it not because those better men, to whose hearts they were most acceptable, have not in the struggle for existence, and in the art of rearing descendants to inherit their qualities, been blessed with a corresponding advantage over the more ignoble beings, who by natural disposition were indifferent to, or positively opposed to, them?

Even if it could be shown that humanity is making an ethical advance in the midst of its present surroundings, a very reasonable apprehension must occur to thoughtful minds, that the conditions of life affecting morality may be very terribly changed on the arrival of that—by no means very distant—time when the rapid increase of our species, and the concurrent exhaustion of that element of the fertility of the earth's surface, which consists of the decayed animal and vegetable matter, which has been accumulated therein during past ages, combine in bringing about a general scarcity of food all the world over; and the question becomes one of who shall be fed and who shall starve—a state of things which, once begun, seems—for anything that appears to the contrary—likely to last.

That professed teleologists should expect an advent of final moral perfection in every nation under heaven is not, perhaps, very surprising; but such an anticipation seems to be very inconsistent with pure scientific principles, the odds against any such result arising independently of purposive control being surely almost infinitely great.

The relative rapidity of multiplication of each grade of intellect will also decide the question as to man's mental advance. The teacher may strive to impart knowledge to the individual, and to strengthen his mind: but the question of the rise or fall, from age to age, of the intellectual capacity of the species will lie with Natural Selection. That the

factors affecting the psychical development of the *Anthropidæ* hitherto have been bringing about what we consider to be improvement is no proof whatever that such progress will continue. It may, or it may not. Positive assertions either way are equally without warrant. But with regard to the conditions which appear to affect the question at the present day we may note one of some importance, which is too often, I think, disregarded. By looking around us we may see that present circumstances generally favour the social rise of the more intelligent individuals of the lower classes of the community. Hence many such persons are drawn out of those strata of society that earn their bread chiefly by using their muscles. It is, I believe, certain that by such abandonment of bodily labour they lose something in prolificacy. An analogous result among lower animals might lead us to expect this. It is because fertility is increased by physical exertion that farmers often put bulls to hard work. An experienced breeder of horses told the Lords' Committee on Horse-breeding (1873, Qu. 1157) that a horse could not be travelled too much. "The more the horse is travelled the more foals."* Common observation leads us to the conclusion that this physical law holds good for mankind also, the large family of the labourer being notorious. Thus stupidity, by keeping a man in the ranks of labour, may increase the comparative abundance of his offspring (inheriting his dulness). This must tend to keep down, if not to lower, the average intelligence of many communities.

Mr. Fiske tells us, in his "Cosmic Philosophy," that though "mankind is destined to advance during future ages in psychical attributes," he "is likely to undergo only slight changes in outward appearance."† On the other hand, we have the opinion of Mr. Herbert Spencer‡ that in the

* In this fact we ought, I think, to see that not only is it incorrect to suppose (as is commonly done) that "Survival of the Fittest" is to be taken as necessarily equivalent to the nearest approach to supposed ideally perfect animal types,—which is negatived by those instances of development (of either species or individual) which result in so-called "degeneration,"—but also that it is not a matter of course that Natural Selection will always bring about the closest adaptability of a species' capacity to its needs. For in the case of those creatures which unite at the time of year when their food is abundant, a defect in the power of procuring nutriment might entail so much more physical labour in the defective individuals that their extra exertions make them so much the more fertile than those which become plethoric, through their being endowed with superior power of obtaining their food with ease. Thus in some cases a check may be put upon the plenary organisation of a species by Natural Selection, and the less perfect animal may thus have the higher claim to be called "the fittest."

† Part II., Chapter XXI.

‡ Principles of Biology, vol. ii., Chapter XIII.

"further evolution in the most highly evolved of terrestrial beings," "augmented bulk" may form a feature—smaller dimensions not being apparently an admitted possibility. To deny that man may become bigger than he is would be to lay just such a claim to a superhuman acquaintance with his future environment as has been deprecated above. But although such knowledge is unattainable, attention may be drawn to the fact that man's present outward circumstances appear to favour a reduction of his bulk; and indeed it can hardly be doubted that in our manufacturing towns considerable progress has already been made in that direction,—man in this respect following the example set to him by a vast number of other genera.

As compared with those of the animal kingdom at large, human dimensions are prodigious—a million times greater than those of the creatures which, at least in regard to social qualities, rank next to him. The drawbacks to such massiveness in beings which have to move themselves over a planet, at the surface of which the attraction of gravitation is so great as it is on this globe, are clear enough; but the evils attendant thereon have been, as far as concerns man's development in the past, more than counterbalanced by other considerations, chief among which was warfare, personal and tribal. During all the ages in which woman was the object of violent contention, a capacity to deliver a blow from a greater height (and with consequently accelerated speed and corresponding force) than lay in the power of an opponent, was of sufficient importance to a candidate for feminine favours to counterbalance many disadvantages resulting from ponderosity. (Indeed so soon as our hirsute ancestors were sufficiently advanced to wield a club with the right arm, the attainment of the erect posture—if not already reached—must have been greatly expedited by this one consideration.) It is probably on this account that good height in man, in order to gratify our inherited æsthetic taste on the point, must be from the shoulder downwards, and must not be chiefly consequent on the possession of a long head and neck. For the same reason, too, boys, though not taller than girls up to the age of about thirteen, shoot up above them as they approach the age at which their forefathers fought with their right arms. The prevalence of the use in battle of weapons of precision, in the place of arms which gave due advantage to personal strength, must, on the contrary, tend to reduce human stature, each bullet being the more likely to fulfil its mission the bigger the man against whom it is despatched. The general substitution of

machinery for manual labour may be expected, however, to produce a much greater effect than the change in the nature of homicidal weapons.

That the inhabitants of manufacturing towns should be seen to be "degenerating," as the process of their reduction in stature is—as I consider very inconsiderately—termed, is a matter of lamentation to many writers, who apparently can only regard the smaller individuals as stunted, or checked in growth by their evil physical surroundings; whereas it may, surely, be more reasonably regarded as purely a case of natural selection. Are not little people as competent to control machinery as their larger mates; and are they not therefore able to earn as good wages at such occupation? As they cannot need to spend so much on food, clothes, or even house-room, they are clearly so far at an advantage in the struggle for existence with their more bulky competitors, and are therefore so much better able to wed, and increase and multiply, and to rear the (diminutive) offspring which they produce. In the past the big men have had, on the whole, the better chance of transmitting their dimensions to succeeding generations. In the coming age of machinery the smaller men are more likely to transmit their diminutiveness.

Inherited sentiment may indeed check the speed of this dwarfing process, the smaller people having usually a natural liking for taller mates. But this feeling will die out; for the possession of it, inasmuch as it may affect the matrimonial selection, will be apt to lessen the number of an individual's descendants. And thus in every generation there will be a greater proportion of marrying people, who, far from sneering at small stature in the opposite sex, will—on the principles explained in my article on "Beauty" (No. XCVIII.)—delight in it.

This continued reduction of stature may very well proceed, I should suppose, at the rate (say) of an inch in a century. And, since the advantages of the change are more apparent than the drawbacks thereto, it seems not unreasonable to expect that the operation will thus go on till a very great change is effected. The smaller mankind become the more elbow-room there will be in every situation, and in greater comparative abundance will be all the products of the earth's crust. At the present time, moreover, man is able to transport himself rapidly from place to place only on roads specially made with much labour and at great expense. A material diminution of his weight would go far to facilitate aërial locomotion. And it is not, indeed, an altogether

unreasonable supposition that man (should the Struggle for Existence in the ages to come be so intense as to reduce him to a pigmy) may succeed in training birds to waft him hither and thither in any required direction, the advantage to the individuals first capable, on account of their lightness, of being so transported increasing the tendency towards the reduction of the average weight of the species. Such an achievement will not appear impossible except to those minds which can only run in familiar groves. But far be it from the present writer to put forward any idea whatever anent the human future with that unquestioning confidence with which so many philosophers are in the habit of forecasting it,—as to mind, body, morals, manners, circumstance, and everything else,—and which, indeed, being without corresponding support, must be considered as unscientific and indefensible.

IV. COMPOUND ORGANISMS AND THEIR LESSONS.*

SOME time ago ("Journal of Science," 1882, p. 401) we gave a sketch of the characters which mark the development and reproduction of the Protozoa as compared with the same processes in the higher animals. We showed that as regards the former the terms "birth" and "death" have scarcely any meaning, or at least a meaning quite other from what may be traced in larger and more complex beings. We hinted, too, at startling questions touching personality and individual identity which a study of the Protozoa cannot fail to suggest.

We will endeavour to carry the subject a little further, at least as far as organic individuality is concerned. Let us turn our attention to the opposite extremity of the organic scale,—if at least Professors Minot and St. George Mivart will pardon us for speaking of man as the highest animal. One of the plainest characters in a man—or we

* Chapters on Evolution. By ANDREW WILSON. Chapter XIII.

might say in every normal vertebrate animal down to the humblest fish—is his complete isolation from the rest of the world. He stands in no physical connection with any other portion of matter, living or lifeless. He has certain well-defined boundaries, which even the least scientific observer cannot mistake. Of what takes place within that boundary he is conscious. Of what happens beyond his consciousness gives him no information.*

Hence, as regards individuality or personality, the higher animals seem to contrast sharply with those minute and simple beings which are one with each other and with their *quasi* forefathers. But this contrast is only in seeming. There are stages or grades in individuality. There are animals concerning which we must pause whether to pronounce them independent beings or parts of some larger totality. We may even be compelled to answer this question differently according to the point of view from which it is approached. The creatures in question are the so-called compound or "colonial" organisms, of which the sponges, the Hydræ, &c.,—all, be it remembered, water-animals,—are familiar instances. Such an animal is at first produced from a single egg, and may thus claim in one sense to be regarded as a well-defined individual; for whatsoever springs from *one* egg may fairly claim to be regarded as *one* animal, just as whatever springs from *one* seed is considered to be merely *one* plant, and not an indefinite number of plants. But the zoophyte—say the common *Sertularia*, or sea-fir, so called from its resemblance to the sprays of a fir tree—consists, again, of multitudes of animalcules, each resembling a Hydra. Each such animalcule captures food and digests it; each ultimately dies, and is replaced by others which spring not from eggs, but from buds. Hence the question arises, Which is in reality the individual, the whole spray or the animalcule,—the product of original egg or each bud it has sent out? Scientific zoology considers that the balance of evidence is in favour of the former view, and names the animalcules above mentioned "zooids."

But before coming to a conclusion we must consider some other cases of compound life.

Remarkably curious and instructive is the green fresh-water sponge (*Spongilla*) found growing on woodwork immersed in water, such as piles and sluice-gates. It propagates

* We do not intend to dogmatise on the question whether a person without any evidence passing through the medium of the senses can be directly aware of ideas or emotions occurring in the mind of another. To take up this subject would be a digression.

itself both by eggs and buds. If one of these beings is cut into two or more pieces, each part lives and increases as if it had been a primarily independent organism. Sometimes also they are known to split up spontaneously, each portion starting in life independently, like the halves of a Protozoon which has divided itself. What is still more curious, if two Spongillæ are placed close together they sometimes merge into one individual. Here, then, we have beings where it is impossible to decide by inspection whether any one of them is the produce, and the whole produce, of a single egg or not. Such a *Spongilla* may have divided itself, and one of these divisions may have coalesced with another *Spongilla*, which may be the entire product of a distinct egg or only a part of such product.

Or we may take that fresh-water polype known as the Hydra, which has long been known from the fact that it cannot be killed by mechanical division. Let it be cut transversely, or longitudinally, or obliquely into two parts, or into more, each section becomes an independent Hydra. Naturally it throws out, at its sides, buds, which like itself are each provided with tentacles and with a mouth for capturing and absorbing food. Each such bud grows, and ultimately is detached as a distinct animal. Often before being thus thrown off it puts forth buds, and thus it may be said to exercise all the normal functions of animal existence whilst still united with its parent. At the same time the Hydra is capable of reproducing itself sexually by eggs. Consequently when we find one of these little beings we cannot ascertain whether it has sprung from an egg or from a bud. In the former case it is, according to established views, a distinct animal. In the latter it is only a piece or fragment of an animal, forming a whole along with some other portions not to be identified, if still existing. Yet by no consideration, morphological or physiological, can the one, as it falls into our hands, be distinguished from the other. Each grows, captures and assimilates food, and reproduces itself both by eggs and by buds, precisely as does the other. The individuality and personality of these little beings must evidently be highly complex and perplexing. Up to a certain date the specimens formed by budding have been one with their parent and with each other.

Another somewhat different type of compound or colonial existence is shown in the Flustra, or sea-mat, an animal often mistaken for a sea-weed. On each side of every "leaf," as it is commonly called, we find a multitude of zooids, each inhabiting a little cell and leading an apparently independent

existence. Each feeds, digests, and assimilates without—as in the zoophytes—throwing the product of its digestion into one common stock. Each reproduces itself both by eggs and buds. The eggs give rise to new, unconnected individuals, whilst the buds increase the specimen before us. There is no general nervous system, no circulatory apparatus connecting the whole colony together. The removal of a portion, and the death of its zooids, inflicts no perceptible injury on the remaining part. If it be asked how the whole adheres together? the answer is easy: the cell-wall of each zooid adheres to the cell-wall of its neighbour, forming thus a continuous structure. It is evident that while such a Flustra lives on and increases, its component zooids die in succession and are replaced by their offspring, particular life and death succeeding each other within a more general life. As a matter of course an entire Flustra, like an entire zoophyte, is not limited in the number, the shape, and the size of its ramifications. Here, therefore, one of the distinctions between animals and plants proposed by our old master Oken falls to the ground. He maintained that the animal was geometrically and arithmetically limited and definite, whilst the plant was neither. Thus we know the number of the limbs and other parts of a normal unmutilated animal of the higher classes; we know their shapes, and their respective positions. But we do not know the number of branches and twigs which a tree of any kind ought to have, nor yet their shape or their relative positions. But if Oken had taken the zoophytes into consideration he would have found in the entire animal—*i.e.*, in the product of a single egg—as little regularity of form and number as in the tree, the product of a single seed. Definite regular structure is found in the one case in the zooid, and in the other in the flower-bud.

But an indication or forthshadowing of compound life may be traced in higher forms than those which we have just been considering. Among the Annuloida we find a well-known and disreputable being, the tape-worm. This creature has indeed a head, but otherwise it consists of a multitude of segments familiarly called "joints," each of which has to some extent an independent individuality. Each joint has its own set of sexual organs, both male and female, and may be regarded as a bud thrown off by the head. It may, however, not be judicious to attach too much weight to this example of the tape-worm. Like parasites in general, this animal has reached its present position by a process of degeneration or retrograde evolution.

The Naididæ, however, afford us a case of compound life in the great group of the Annulosa. *Cirrhatula*, a genus near akin to *Nais*, is reproduced by budding, and, as we have seen, budding involves compound personality. Both *Cirrhatula* and *Nais* are water-worms, provided with tentacles at the head, and with a pair of leg-like processes attached to each segment. If one of these creatures is observed for a sufficient length of time it will be found to be constricted at some point towards the hinder part of its body. The part behind the constriction or narrowing grows in length, gains more segments each with its legs, and develops a head with eyes. But it still for a time remains attached by its head to the mother, from whom it derives its sustenance. It may happen that before the young individual has become fully perfected, and detaches itself, a third portion begins the process of assuming a distinct organisation. Thus Prof. Müller found three individuals adhering together in one length in a manner that may be familiarly illustrated by a link of sausages. "The mother had thirty footed segments; the youngest daughter, or the one nearest the mother, had eleven, but the head was not yet developed. The most remote had seventeen rings, with a head and eyes, and the tail of the mother. The intermediate specimen had also seventeen rings and a head." Successively these portions, as they become fully developed, detach themselves and start on an independent career, producing new individuals in the same manner.

It is worthy of note that these portions successively detached are without organs for the production of eggs, the last-formed individual forming an exception. Here we find a fact which re-occurs in a modified form among certain insects.

Here, again, we find relations so different from those which prevail among ourselves and our near kindred in the animal world that our common terminology proves misleading. We have called that portion of the *Nais* which includes the original head the "mother," and the portions which develop heads of their own "daughters." But everyone will see that in so doing we are taking liberties with the words. Whatever consciousness such creatures possess—and we have certainly no rational warrant for pronouncing them unconscious—must be common to the entire series up to the date of their separation. Let us suppose a cat reproducing its species in this manner. The question might arise, Which is the Pussy who a couple of months ago jumped upon our work-table and overturned an inkstand? It would be

impossible to answer. Yet what would thus puzzle and confound us in a cat is the common order of nature in the *Nais*.

In the higher departments of the animal world, in the Mollusca, Arthropoda, and Vertebrata, we no longer find such distinct evidences of compound existence. Reproduction by budding here no longer occurs, and the individual animal no longer consists of an aggregate of zooids which may lay claim, more or less plausibly, to the rank of independent organisms.

Still the transition from compound or "colonial" to single unitary existence is not made abruptly. Certain reminiscences, if we may so speak, of the earlier multiple life may be traced even in the highest animals.

Suppose we take one of the simpler Annulosa,—say a centipede. We find it composed of a number of segments, or "somites," between which—save the head—and the last abdominal joint there is little difference. Each bears a pair of legs with their necessary muscular apparatus; each has its pair of tracheæ, forming a complete respiratory organ; each contains a nerve-centre, or ganglion, differing relatively little in size and complexity from the brain. So far, then, each "somite," or joint as it is popularly called, possesses many of the characters of an independent being. But none of them, if severed from the rest, is capable of maintaining an independent existence or of surviving for more than a few hours. Reproduction is exclusively effected by means of eggs, secreted by especial organs, and in most cases it requires the concurrence of two individuals of opposite sexes. Budding has ceased, in as far as the production of an entire animal is concerned. At the same time we find a remnant of this mode of reproduction in the power of certain animals to develop new limbs or organs in place of such as have been mutilated or cut off. Thus the newt, if deprived of a leg or tail, can in time replace the missing organ. In snails the eyes, the tentacles, and the lips, if amputated, are completely restored. But the higher we ascend the more does this power of partial reproduction fade away, and in man it plays a very insignificant part indeed.

For all this the generation of certain of the Arthropoda presents us with a phenomenon which closely approximates to reproduction by budding as witnessed in the lowest animals and in plants. We refer of course to parthenogenesis. It has been observed that several kinds of female insects lay fertile eggs without having had connection with a male of their species. This is pre-eminently the case with the

Aphides or plant-lice. The eggs of these pests, after remaining dormant through the winter, give rise to a brood consisting solely of females. These again, in turn, without impregnation, deposit so-called eggs,—more correctly pseud-ova,—from which spring nothing but females. So the process continues through the summer. But in the autumn the last brood consists of both sexes, and the impregnated eggs now produced remain through the winter. If the reader will turn back he will see that this process of reproduction is almost exactly identical with what we have noticed in the *Nais*. There, too, we found a succession of individuals formed by budding, and able to reproduce themselves by budding alone, until the series is finally terminated by an individual capable of producing eggs. The unimpregnated egg, or pseud-ovum, of the *Aphis* is the representative of the bud of the *Nais*. If we adopt the view that all that proceeds from a single egg is an individual animal, then all the descendants of an *Aphis* of the autumn brood form along with it one individual, separate bodily, but connected in their development. Such a succession of Aphides is therefore a compound animal.

Full parthenogenesis does not, so far as has been traced, occur in the Vertebrata, although the unimpregnated egg of several species has been known to undergo the first rudiments of segmentation. This may well be considered as one of those cases of "reversion" which show that the higher animals are sprung from forms in which gemmation, and consequently compound existence, are normal.

Even in the anthropoids, and in man himself, there are facts which point in the direction of a complex personality. The two-headed monstrosities which have been brought into the world, and as a rule hastily dismissed out of it, if carefully observed during life and as carefully dissected after death, would not merely raise, but possibly aid in solving, certain questions which go to the very root of our idea of personality.

A simpler phenomenon of daily occurrence is the presence in man, and as part and parcel of his system, of certain minute organisation—to wit, the white-blooded corpuscles. Many biologists would place these particles on a level with certain of the Protozoa. Thus human life and the life of every higher animal would be complex indeed, including the lives of myriads of microbia. Do they exist for our sake, or we for theirs? These questions are unscientific, but they are on a level with some which are still too frequently asked.

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V. ON TECHNICAL EDUCATION.

By ROBERT GALLOWAY, M.R.I.A.

(Continued from vol. iv., page 576.)

IN the last article on Technical Education it was stated that some of the more important differences in the systems of teaching adopted in England and Germany would be compared in some of the following articles on this subject.

We will commence by contrasting the plan that has to be followed in all the schools, with the few exceptions to be presently named, under the Department of Science and Art, with the methods of instruction followed in corresponding educational institutions in Germany.

Payment on results is the centre round which the whole system of teaching in the Department of Science and Art Schools revolves, with the exception of the Science and Art Schools or Colleges at South Kensington and the corresponding ones in Dublin: the reasons assigned for these exceptions, and the plan and management of these exceptional institutions, will be deferred until the necessity for a Minister of Education comes to be considered.

When the present Chairman of Committees of the House of Commons, the Right Hon. Lyon Playfair, was Secretary of Science in the Department, the payment on result system was not the one followed; but shortly after he left it was established in that, and afterwards in the Art, branch. When Government Schools of Art were also first established in England the teachers of Art were paid by salary; afterwards by the certificates of qualification they had obtained; and subsequently the present system—payment on results of instruction as tested by the examination of the students—was substituted for payment by certificates. But the teacher does not receive payment on results for every class of students, but only for those who are in the receipt of weekly wages, and their children; or persons in the receipt of not more than £200 a year, and also their children, and teachers and pupil teachers in some elementary schools.

As payment on results is the centre, as we have already stated, around which the system of instruction under the Department revolves, it is desirable at the outset of our investigation to learn what advantages the Department

claims for this over the other two systems of payment that had previously been in operation. The late Sir Henry Cole, in his examination before the Select Committee on Schools of Art, held in 1864, was asked the question. His answer was—"I do not think, as respects the old expenditure, there will be much difference between the one and the other. The advantage of the new system is that you can keep the expenditure more under control; you have only to raise the standard from time to time, and thereby you can keep the total sum under control." In answer to another question, on the same subject, he said—"I think that the new system will call for larger sums than the old system did, but I think the new system has the advantage of being quite under control, because, of course, if the standard be raised there will be less expenditure." He subsequently gave the following remarkable answer,—remarkable it was at the time it was given, and it appears still more remarkable at the present time, when it is all but universally acknowledged that we are still far behind continental countries in scientific and technical education; and in consequence we have sent out Commissions and Sub-commissions all over Europe* to investigate the modes of instruction adopted in the different European countries for teaching these branches of education, in order to try and improve our own. It is pregnant with information as to some of the causes why we are so far behind continental countries in scientific and technical education, after all the vast sums of money that have been spent for their cultivation by the Department of Science and Art.

The question asked—"Will you explain to the Committee more fully the third reason for the introduction of the New Minutes; namely, to bring the general expenditure upon Schools of Art more under control by the greater facility of raising the standard?" Answer:—"Supposing Parliament should say to us, 'Instead of distributing £15,000 amongst Art Schools, you should only distribute £10,000,' *all we* should have to do under the New Minutes would be simply

* In the last article we noticed some of the Commissions and Sub-commissions that were appointed to visit continental countries for the purpose of inquiring into the methods adopted by the different States for imparting technical instruction. We may here add that the Commission of Technical Instruction have already visited the following countries—France, Germany, Austria, Switzerland, Italy, Holland, and Belgium; and one of the members of that Commission, with the Secretary, has paid a special visit to the Black Forest, in order to collect information with respect to the native home industries of that district. And quite recently the Manchester School Board appointed a deputation to visit specially the Paris schools with a like object.

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to raise the standard of excellence. If we did so, of course there would be fewer amounts of public money to be given away; therefore that puts the matter *entirely* in the hands of the Department. Let me say that has been exactly the case with the Science Minutes. *I venture to say emphatically they have been a brilliant success.* The success of those Minutes led the Department to see that they might, with judicious qualifications, be made strictly applicable to Art. For instance, last year we found that by the bonuses offered as prizes in the Science Minutes, a master in the northern part of England was earning, upon results, for teaching one class only, mechanical drawing I think, £250. *The Lord President looked about him, and said 'This is a large sum; we must raise the standard a little, and we can reduce it to* £150 or £100'; *it is entirely under control.*"

The Lord President of that day showed the value he placed on a good teacher by a very extraordinary course of proceeding; I rather think our nobility show their appreciation of a good cook or a successful jockey by the reverse method. The standard of excellence, it will be observed, was not to be raised for the purpose of giving the *taught* better instruction, but for the purpose of cutting down the *teacher's* earnings: as one teacher had earned £250, he and all the other teachers of that subject were to suffer pecuniarily for it; one would rather have thought the proper mode of proceeding would have been for the Lord President to have sent some competent educationist to see how this exemplary teacher taught his subject, for this visit might have proved as advantageous to the country as the visits of some of the roving commissions to continental countries,—and to ascertain how many hours a day this excellent teacher gave to his work, for that is a point that Sir Henry never seemed to have considered. Let us for a moment reflect how a commercial establishment would prosper under such a system. We will take the case of a large mercantile establishment where a large number of salesmen are employed, and who are paid solely by the commission they receive on the goods they sell: one of these salesmen so well performs his duty that he earns a fair, but by no means excessive, income; forthwith, on that account, the partners in the concern reduce not only the scale of commission in his case, but in the case of all the other salesmen. How would a mercantile establishment prosper under such a system? Would not every efficient salesman leave, and would they not also advise others not to enter that establishment?

Sir Henry stated, on the same occasion, that their system

of teaching drawing was far superior to the systems of all Europe put together: one of the members of the Technical Commission, Dr. Roscoe, has recently stated the very reverse; he says the French system of teaching drawing is superior to ours:—"A little French or German boy out of the street is able to draw, and draw accurately, in a way which is astounding to an Englishman conversant only with the work of the ordinary primary English school."

Sir Henry also said that he thought that when South Kensington was once provided with permanent and safe buildings, the annual Parliamentary grant would not appreciably increase; in fact that was the advantage to be derived from the payment by result system. South Kensington has been provided with permanent and safe buildings, yet the net increase of the grant this year over that of last year is £18,369. Sir Henry did not state what he thought would be effected by the payment on result system in improving the Art and Science education of the country: this is what we purpose examining into, but before commencing we must bring under the notice of our readers three paragraphs taken from the Departments' Science Directory for 1881: we shall number the paragraphs for convenience of reference.

1. "The object of the grant is to promote instruction in Science, especially among the industrial classes, by affording a limited and *partial aid or stimulus* towards the founding and maintenance of Science Schools."

2. "*The amount is liable to be decreased, and eventually withdrawn. Payments to teachers, therefore, must not be looked upon as perpetual, or in any way conferring on the teacher a claim to any payments beyond those offered from time to time.*"

3. "*All possible care will be taken by the Department that the Examination papers shall be forwarded in accordance with the applications, and that the results shall be correctly issued. As, however, the number of schools is very large, mistakes may occur. The Department cannot undertake to rectify them, nor will it be responsible for any loss which may thereby occur.*"

It will be seen from par. 3 that if the Examination Papers miscarry no examination will be held, and the teacher will receive no payment or compensation from the Department: he will therefore, as far as the Department is concerned, be deprived of a year's earnings. We learn from par. 2 that a Science teacher under the Department has no certainty of any payment from the Department beyond the present; and he does not even *know* what he may receive for his present work, for it does not depend on the labour and time he has given to his classes. Other teachers who prepare pupils for

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examinations get paid whether pupils succeed or not; but the Science teacher has to depend for the payment *he may receive from the Department, not solely* on the marks *the examiner* may give, as there are exceptional rules which exclude the teacher receiving payment on results in not a few cases. Uncertainty in the *duration* of an employment, and uncertainty as to the *amount* to be received for the labour and time that has been given, must ever act unfavourably in securing the best talent.

VI. THE METEOROLOGY OF SHAKSPERE.

WE may safely assume that Englishmen in the olden time, like their sons in these days, took much interest in the weather. They discussed the influence of the past portions of a season, the effects of the present showers or sunshine, and the good or evil signs for the coming day, month, or year. For this they had even stronger inducements than ourselves. A wet harvest time might bring the perils of actual famine home not merely to scattered individuals, but to entire districts. Further, the weather and its signs were looked on in what we should regard as a superstitious light. Unusual seasons over and above their own unpleasantness were held to forebode foreign wars or civil tumults, pestilence, and other calamities. It may be, therefore, not uninteresting to glance at the weather-lore of our forefathers, and ask in how far their rules for a foreknowledge of the season were well founded. For connecting this subject with the name of Shakspere we have good reason. We have no certainty as touching the scraps and jingles in which popular meteorology is embodied. They may be old as the hills, or they may date no further back than the last century, and may have been blended with the results of modern investigation. But for the passages on this subject which we find here and there in the writings of Shakspere we have a minimum limit. They must represent the traditions current in the days of his youth, and which had been handed down for at least a couple of generations. They must have arisen in an age

when the barometer, the thermometer, and all other meteorological instruments were still unknown.

The first point we notice is that the south wind is held in strange disrespect. It is regarded as unhealthy, as boisterous and wet, and as especially connected with fog. Thus we read—

> "All the contagions of the south light on you."
> *Coriolanus*, I., 8.

> "A south-west blow on ye
> And blister you all o'er!"
> *Tempest*, I., 4.

Elsewhere we find—

> "The south fog rot thee!"

And again—

> "Like foggy south puffing with wind and rain."

In short this wind is never well spoken of by Shakspere, except in one passage:—

> —— "Like the sweet south
> That breathes upon a bank of violets,
> Stealing and giving odour."
> *Twelfth Night*, I., 1.

So exceptional are these lines to all other references to the south wind that in Knight's Cabinet Edition an emendment is proposed. The editor would read "sound" for "south."

It is scarcely necessary to say that this emendation involves greater difficulties than the one it is intended to remove. Shakspere assuredly would never have likened a strain of music to a "sound," nor spoken of a sound carrying along with it the odours of the violets.

But how comes the poet to couple the south wind with fogs? We know that fogs are exclusively connected with the "polar current," *i.e.*, northerly or easterly winds, though of course so gentle as to be only just perceptible. The moment the wind turns to the south or south-west London breathes afresh, and finds that the threatened doom of the great city is not yet.

Besides one of the passages quoted is self-contradictory. "Foggy south puffing with wind and rain!" Puffing wind and rain, from whatever quarter, dispel a fog.

Nor are the charges of unhealthiness brought against the south much better founded. The south-west wind, especially, blowing as it does over a wide expanse of ocean, is exceedingly unlikely ever to have wafted any pestilence

to the shores of England. We think of the proverb still current in Yorkshire and Lincolnshire:—

> "When the wind is in the west
> The weather is the best;
> When the wind is in the east
> It's neither good for man nor beast."

It is still possible that as fens and marshes were much more abundant in the Elizabethan age than they are now, and that as the south wind is generally accompanied by warm weather, malaria may have been more common in times of southerly winds than when the weather was colder. But in all other respects we cannot do other than pronounce the epithets which Shakspere applies to the south wind grossly libellous, and the traditions upon which they are founded instances of loose observation. We should, indeed, be glad to escape coming to this unfavourable conclusion; for our great poet, though his attention was mainly fixed upon human passion and human character, had yet a keen eye for external Nature, as we shall show below. The Ancient Britons are said to have applied the name "cloudy or misty sea" to the German Ocean, from the fact that winds blowing from that quarter were apt to bring fog and gloom. But if the south wind was little admired in the Elizabethan days, the northern wind fared no better. Shakspere would not have committed himself by writing an ode like that perpetrated by Kingsley. The longing which some people in these days profess for a good old-fashioned winter, and the opinion of the "bracing" character of a north-easter, are, we suspect, notions of somewhat modern origin, and are often chimney-corner aspirations, about as real as Jamie Thompson's praises of early rising. Shakspere shows no love for winter:—

> "You and you are sure together
> As the winter to foul weather."
> *As You Like It*, V., 7.

It is only luxurious ages and persons who can expose themselves to the weather only when and how they like, and come in to a comfortable home when sufficiently "braced," who can like winter.

The opinion is often expressed that the climate of these islands, and indeed of Western Europe altogether, has undergone a change for the worse during the last two or three centuries. Even if our average temperature has not decreased, or our mean rainfall—or rather number of wet

days—been augmented, we have, men say, a less prospect of warmth, and dryness, and calm coming when they are wanted,—that is, from the blooming of the wheat to the ingathering of the various crops. True, we have had, since 1870, great store of unseasonable weather, among which 1879 holds a memorably evil pre-eminence. But let us listen to the following passage :—

> "Therefore the winds, piping to us in vain,
> As in revenge, have sucked up from the sea
> Contagious fogs; which falling on the land
> Have every pelting river made so proud
> That they have overborn their continents;
> The ox hath therefore stretched his yoke in vain,
> The ploughman lost his sweat, and the green corn
> Hath rotted ere its youth attained a beard.
> The fold stands empty in the drowned field,
> And crows are fatted with the murrain flock.
> The nine-men's morris is filled up with mud,
> And the quaint mazes in the wanton green,
> For lack of tread are undistinguishable.
> The human mortals want their winter cheer,
> No night is now with hymn or carol blest;
> Therefore the moon, the governess of floods,
> Pale in her anger washes all the air
> That rheumatick diseases do abound.
> And thorough this distemperature we see
> The seasons alter; hoary-headed frosts
> Fall in the fresh lap of the crimson rose;
> And on old Hyem's chin and icy crown
> An od'rous chaplet of sweet summer buds
> Is as in mockery set. The spring, the summer,
> The chiding autumn, angry winter change
> Their wonted liveries, and th' amazed world,
> By their inverse now knows not which is which."
>
> *Midsummer Night's Dream*, Act II., Sc. 2.

Is this a mere imaginary description? We should say that it is a most faithful picture of such a season as that of 1879, with all its distressing features. We have summer frosts, short fits of mild weather coming when cold would be more seasonable, overflowing rivers, fields swamped, sheep perishing of foot-rot and of "flukes" in the liver, the corn rotting before it can reach maturity, the field-paths becoming indistinguishable because impassable. It is, in short, 1879 to the life, as any faithful observer—especially if living in a rural district—would have found it, and no one could have given its sad characters at once so strikingly and yet so briefly. We see, then, that cold wet summers are not a misfortune peculiar to the nineteenth century. A glacial epoch may be returning, but "cruel 1879" is no proof that such is to be the doom of our immediate posterity.

The appearance of the sky at sun-rising has always been

considered an indication of the weather that is to follow. Proverbs in common use in France and Germany, as well as in Britain, warn us against a red sky in the morning. Shakspere was no stranger to this view, which does not always hold good.

> "As doth the blushing discontented sun
> From out the fiery portal of the east,
> When he perceives the envious clouds are bent
> To dim his glory, and to stain the tract
> Of his bright passage to the occident."
>
> *Richard II.*, Act III., Sc. 6.

Here we have a picture of a particular type of unpromising morning, which every observer of the weather must have observed, and which was but too common both in 1879 and in 1882. The sun rises "blushing"—*i.e.*, red—into a tract of clear, fiery sky, beyond which lies a dense bank of clouds, which maintain their position and thicken till the whole sky is overcast, and the rain sets in.

Another red dawn is described, as on the day of the battle of Shrewsbury:—

> "How bloodily the sun begins to peer
> Above yon busky hill! The day looks pale
> At his distemperature.
> The southern wind
> Doth play the trumpet to his purposes,
> And by his hollow whistling in the leaves
> Foretells a tempest and a blust'ring day."
>
> *Henry IV., Part I.*, Act V., Sc. 1.

Here, in addition to a red dawn, we have another indication of rain drawn from the peculiar character of the wind. In various rural districts we have heard a "bustling wind" spoken of as a sure sign of rain, and, as far as our observations have gone, it has invariably proved correct. This wind is by no means violent; it does not seem to move the stems or the larger branches of trees or shrubs, but it causes a great commotion in the leaves, especially if these are broad.

It is, perhaps, curious that in the writings of Shakspere we find no reference to the sunset as an augury for the day to come. Nor is the rainbow mentioned, concerning the signification of which there exist not a few contradictory proverbs. All, we think, agree that a rainbow in the morning is a bad sign. But the English countryman is apt to regard—

> "A rainbow at night
> As the shepherd's delight."

The French peasant, on the contrary, says, more wisely as we think,—

"Arc en ciel du soir
Il faut voir."

Certainly in settled fair weather rainbows, either at morning or night, are not likely to make their appearance.

The cry of the owl seems to have been held as characteristic of stormy weather:—

"The obscure bird
Clamoured the live-long night."
Macbeth, Act II., Sc. 5.

It may be doubted whether this circumstance is mentioned as characteristic of stormy weather, or as an omen that mischief of other kinds was about. We have never met with any popular saying which connected the voice of the owl with rain and storm, nor have we observed it to be a "weather-wise" bird. The notion that its hooting is a sign of death has been common for centuries. Some wise man attempted to explain this supposed fact by the assumption that the owl smells the approach of death in a sick man, and flutters screaming round his house in an effort to get at the body. This is a curious collection of blunders. The owl prefers, like a true sportsman, to kill game for its own dinner, and does not care for a prey which has died a natural death. Secondly, the bird has by no means a very acute sense of smell, and would be utterly unable to detect the odour of a dead or dying man outside the house. She is very possibly attracted by a light in the sick chamber, and puzzled thereby, as are sea-fowl by a lighthouse, flutters around instead of attending to her lawful business.

The notion of the unwholesomeness of the night air must have been already current in Shakspere's time. We read—

"To dare the vile contagion of the night,
And tempt the rheumy and unpurged air."
Julius Cæsar, Act III., Sc. 3.

It is indisputable that in malarious districts the night air is especially dangerous. But it may well be doubted if the extreme dread of the night air common in England is anything more than a superstition. There are many people who—whatever may be the temperature, and how dry and calm soever the weather—would be horrified at sleeping with their bed-room windows open. It has happened to us more than once, when on a visit at a friend's house, to find that during dinner the servants had carefully shut the windows,

and thus secured—for us at least—the luxury of a restless night. Perhaps in Shakspere's day malaria might have been more common than in the present time, and to shun the night air was therefore good policy. There are even yet districts in England where we should not prefer to sleep with open windows in an autumn night.

To conclude these somewhat random remarks we will quote a very faithful description of the hush which often precedes a storm :—

> "But as we often see against some storm
> A silence in the heavens, the rack stand still,
> The bold winds speechless, and the orb below
> As hush as death; anon the dreadful thunder
> Doth rend the region."
>
> *Hamlet*, Act II., Sc. 7.

This passage, like the account of the wet season which we cited above, is evidently the fruit of personal observation, and not of tradition.

ANALYSES OF BOOKS.

Siberia in Asia: a Visit to the Valley of the Yenesay in East Siberia, with Description of the Natural History, Migration of Birds, &c. By HENRY SEEBOHM. London: John Murray.

SOME time ago we had the pleasure of examining Mr. Seebohm's "Siberia in Europe," and we are glad to find that the work before us is fully equal in interest to its companion volume. With the same main object in view—the investigation of the geographical distribution of birds, and of the variations caused by locality—the author has explored Siberia proper as far as the Valley of the Yenesay, and made a number of most important observations. Nothing can better show the difference in spirit between the Old and the New Natural History than the manner in which he has carried out these explorations. An ornithologist of the year 1776 who had gone over the same ground would have simply presented us with an inventory of species to be found in certain localites; he would have duly indexed all forms he saw differing from their nearest West European allies as "new species," or else have overlooked their peculiarities altogether; and the question why and how they differ, if it ever entered his mind, would have been suppressed.

But the book is not entirely filled with bird-lore. We meet with valuable facts anent the topography, the resources, and the climate of the regions traversed, and on the peculiarities of their inhabitants.

In the neighbourhood of Omsk Mr. Seebohm remarked that some of the villages were exclusively Russian, whilst others had a Tartar, and consequently Mohammedan, population. He notes that "the cross was too often the symbol of drunkenness, disorder, dilapidation, and comparative poverty, whilst the crescent was almost invariably the sign of sobriety, order, enterprise, and prosperity. At Omsk he saw, in the museum formed by Prof. Slofftzoff several birds which have not been recorded east of the Urals, such as the blackcap, the garden warbler, and the Icterine tree-warbler. He adds, however, in comment, that the specimens bore no special labels to authenticate the localities, so that the fact of their having been shot near Omsk must be accepted with hesitation.

At Yenesaisk Mr. Seebohm met with the first indication of interbreeding between the carrion crow and the hoodie. About 75 per cent of the crows in that district are thorough-bred carrions, perhaps 5 per cent pure hoodies, and the remaining 20 per

cent are hybrids of every stage between the two. He met with similar cases of hybridism in not a few other places. He found hybrid birds mated together, and producing eggs and young. The evidence of the fertility of these hybrids is thoroughly conclusive. Surely nothing more will be needed to uproot the old superstition—we can give it no better name—of the universal sterility of half-breeds. Hybrids between the capercailzie and the black grouse appear also to exist. In Central Europe the male capercailzie has frequently been found mated with the female hazel grouse.

In the Valley of the Yenesay Mr. Seebohm obtained two specimens of Pallas's house martin (*Hirundo lagopoda*), a species nearly allied to the common house martin, which breeds in Eastern Siberia and appears to winter in Borneo. In England it is so rare that the British Museum did not possess a specimen.

Mr. Seebohm's opinion of the Russian character is not too flattering. He writes:—The Russian official is very impartial in the selection of his victims. He plunders the Government, he plunders the people, and he plunders his fellow-officials; but his worst feature is that he helps the rich to plunder the poor. A merchant does not lose caste by doing a dishonourable act. So far from feeling any sense of shame from having acted dishonourably, he feels a sense of complacency. It gives a Russian far more innate pleasure to cheat somebody out of a rouble than to earn a rouble honestly. He feels that he has done a *clever* thing by earning a rouble dishonestly, and he despises the honest man as *weak*."

But this general absence of truthfulness and honour our author accounts for not by considerations of race, but of government. Yet he seems to us to damage his own contention by admitting that the "Turk never lies," though labouring under a still worse government than that of his northern neighbour.

But Mr. Seebohm, though he tells the truth concerning Russia, is not blind to evils nearer home. He writes:—"The uneducated Russian is a child, with a child's virtues and a child's faults. The uneducated Englishman is a brute, a savage, with nothing of the child about him."

In his Preface the author speaks of Siberia as "a magnificent country of superb forests and corn-fields, capable of rivalling those of Minnesota, whilst its mineral wealth includes iron equal in quality to that of Sweden, and gold almost as abundant as that of California, to say nothing of copper, salt, and coal. Siberia is in fact a second Canada in reserve, and the political geographer—looking into the far future, and wondering what is to become of the surplus population and capital of the English and Teutonic races when North America shall be as thickly populated as Europe—may postpone his anxiety for many centuries to allow time for the civilisation of Siberia to re-open the problem."

It is scarcely needful to add that before Siberia can become a field of emigration for the people of these islands an event must have taken place which, according to our author, the Siberians eagerly desire. "Some day, doubtless, this city (Irkutsk) will be a second New York, the capital of an Asiatic United States, a free Siberia from the Ural to the Pacific. Every Siberian imbibes the notion of freedom with his mother's milk. Though born in Russia, or the child of Russian parents, he repudiates his nationality, calls himself a Siberiak, and is proud of his country."

Differing from the "Anglo-Saxon"—whether of Britain or America—in a number of points, the Russian agrees with him in his propensity to sect-forming. Mr. Seebohm had an opportunity of visiting the village of Toer-o-Kansk, the seat, or rather place of banishment, of one of the strangest of these sects. It is described as a model village, "without crime, where idleness and drunkenness were unknown. Yet the people did not look happy. There was no fire in their glance, no elasticity in their step; there seemed to be no blood in their veins. It was the village of the Scopsee, a sect whose religion has taken an ultra-ascetic form. All the men were castrated, and in all the women the milk-glands were extracted from the breasts. They ate no animal food except fish, and did not even allow themselves butter or milk. Spirits, wine, tea, and coffee were prohibited. Although the population of the village numbered under a score, yet there were two sects of Scopsee among them; one drank milk and the other did not." We think it may safely be said that no such community could have arisen among a French, Spanish, Italian, German, or Scandinavian people.

Passing to a subject which for us has a more special interest, we note the author's remarks on the migration of birds. In his former work he gave some interesting observations made at Heligoland. He has since then carried on his investigations during an autumn and a spring in the South of France, and his conclusions have in consequence been somewhat modified. He says, in the work before us, "The marked difference between migration at Heligoland and migration on the shores of the Bay of Biscay is, that in the former locality not a bird was to be seen in unfavourable weather, but that when the wind was propitious birds came over with a rush." At the Bay of Biscay, on the contrary, "a gentle stream of migration seemed always to be going on, in almost all weathers, from early morn till late at night." Hence he infers that during a long land journey birds travel more slowly in unfavourable weather, and rest at night, but if they have to cross the sea they wait for suitable wind and weather.

Our author retracts his former doubts concerning the great routes of migration. Excursions of a few miles inland "took him out of the range of migration." On the west coast of

France he found that birds "appear to migrate low, principally by day, and to follow the coast-line." He now concedes that birds, in crossing the sea, "follow ancient coast-lines." There is no doubt that birds flying northwards in France would find the coasts of the Bay of Biscay an excellent guide. Nor can we wonder that those which cross the Channel should take the "short sea route" from Calais to Dover. Hence it is not surprising if certain migratory species are more common in the south-eastern counties of England than in the south-west. It remains to be traced what birds of passage, if any, cross over direct from the Continent to Ireland, and which pass by way of England. The migration *viâ* Italy and Germany, and those through Greece to Hungary, and by way of the Dardanelles to Bulgaria and Rumania, have still to be studied. The contingent for Illyria, Hungary, &c., certainly seems to follow the Dalmatian coast. He considers that the origin of migration does not probably date back to before the Glacial epoch. "The more one sees of migration the less it looks like an instinct which never errs, and the more it seems to be guided by a more or less developed reasoning faculty which is generally right, but occasionally wrong." The whole of this chapter will well repay a most careful study both on the part of the observer and of the philosophical zoologist.

The ornithological results of Mr. Seebohm's expedition, though somewhat lessened by various mishaps, especially by two shipwrecks, which, as he drily observes, "did not form a part of my original programme," were still numerous and important. He complains of the manner in which Pallas, the pioneer of Siberian ornithology, has been treated by systematists. That able explorer found many species of Siberian birds closely allied to West European species, but still distinguishable. To such forms he gave names, and to those names modern writers have shown scant justice. "In some cases, where they have had an opportunity of comparing examples from Siberia with West European skins, they have admitted the validity of his species; but in other cases, where they have also had access to East European skins, the existence of intermediate forms has been alleged as a reason for denying the validity of the species, and the Siberian forms have been passed by with a contemptuous sneer, as beneath the dignity of Science. In the majority of cases, however, the writers have never seen a Siberian skin, and Pallas's name is consigned to the limbo of synonyms without note or comment. With these writers a form is either a species or it is nothing. They attempt to draw a hard and fast line where Nature has drawn none. They profess to believe in the theory of the development of species, but they never dream of looking at birds from an evolutionary point of view. In their hearts they still cling to the old-fashioned notion of special creation." This is very just criticism. The author backs up his opinions by giving instances of a series of forms, one extreme term of which may occur

in southern or western Europe. Thus in the marsh tit "English skins are the brownest, and have the black on the head extending only to the nape, and are scarcely distinguishable from examples of *Parus palustris* from the South of France, Italy, and Asia Minor. Examples from Norway differ in having the back grey instead of brown. Examples from Archangel are greyer still, and have the black on the head extending beyond the nape. Both these characteristics are more pronounced in skins from the Petchkora, the Obh, and the Lower Yenesay, and still more in those from the Upper Yenesay."

After giving further instances the author returns to the charge at the very conclusion of his book. He writes:—"The confirmed habit of the older ornithologists, of either treating these little differences as specific or of ignoring them altogether, is much to be deplored. I venture to suggest, as a punishment for their delinquencies, that they should be exiled to Siberia for a summer to learn to harmonise their system of nomenclature with the facts of Nature. Dr. Dryasdust and Professor Redtape have committed themselves in the pre-Darwinian dark ages to a binomial system of nomenclature which does not easily lend itself to the discrimination of subspecific forms; and although the American ornithologists have emancipated themselves from the fetters of an antiquated system, English ornithological nomenclators still groan under the bonds of this *effete* binomial system, and vex the souls of field naturalists with capricious change of names in their futile efforts to make their nomenclature subservient to a Utopian set of rules called the Stricklandian code—laws which are far more honoured in the breach than in the observance, and have done great harm to the true study of birds. It is devoutly to be wished that the rising generation of ornithologists would have the courage to throw the binomial system to the dogs, and trample the Stricklandian code under foot, and once for all study Nature and make their nomenclature harmonise with the facts of Nature."

These strictures carry the more weight because corresponding complaints are made, *e.g.*, by entomologists. May we not ask whether the very concept of "species," as still used, does not require serious modification, or, rather, whether the term itself should not be superseded as fraught with misleading reminiscences? In any way we must hold that Evolutionism is useless —worse than useless—if held in theory and ignored in practice. If it is an error, the more we try to apply its principles in our studies of Nature the sooner we shall become aware of the fact. If, as we believe, it is a great truth, we have no right to let it lie idle. It is not pleasant to see that here, in the native country of Darwin, the great reform which he inaugurated is less advanced than it is abroad.

Of Mr. Seebohm's work, as entertaining for the general reader and suggestive for the naturalist, we cannot speak too highly.

Anatomical Technology as applied to the Domestic Cat. An Introduction to Human, Veterinary, and Comparative Anatomy. By BURT G. WILDER, B.S., M.D., and SIMON H. GAGE, B.S. New York and Chicago: A. S. Barnes and Co.

IN order to form a just estimate of the work before us it is necessary to dissociate as completely as possible its matter and its manner,—the facts which the authors undertake to teach, and the strange language which they have seen fit to adopt.

The value of the treatise from the former point of view is indisputable. The reasons given by the authors for selecting the domestic cat as the especial subject upon which a practical knowledge of mammalian anatomy may best be acquired are perfectly sound. The cat, as they remark, is comparable with the domestic animals upon the one hand, and with man, through the monkeys, upon the other. Another advantage is that the cat is less subject to variation than most other animals which are otherwise accessible, so that an observation made upon one cat will substantially apply to all other cats. With the dog, which is about equally procurable, this freedom from variation does not obtain, the differences in the brain of various breeds being considerable, and not as yet fully worked out.

Passing over the Introduction as containing no little matter which must be discussed separately, we come to the first chapter. Here the author gives a descriptive catalogue of the instruments and materials used in dissection, their uses, and preservation. There are, also, instruction for killing the subjects, precautions for cleanliness, comfort, and health, and notes on the treatment of wounds received during dissection. This chapter is admirably written, and in some respects reminds us of the instructions in Faraday's "Chemical Manipulations." Of course one feature of this chapter—the lists of prices and the names of makers and dealers—is exclusively designed for use in America. Some of the prices seem to us very high; *e.g.*, 20 dollars for a tripod dissecting microscope.

In Chapter II. the authors proceed to a general description of the skeleton, and to the "anatomical landmarks."

Chapter III. is devoted to a very carefully written account of the preparation and preservation of anatomical specimens. As an instance of the attention to minute details which characterises the work, the authors give instructions for obtaining alcohol free of duty for scientific purposes, under a particular law of the United States. The cost of alcohol so obtained is only one-sixth of the retail price, but the formalities to be gone through are serious.

The fourth chapter deals with coarse injections. The fifth and sixth chapters treat successively of the bones and the muscles; the seventh is taken up with an account of the abdominal and

thoracic viscera, whilst the eighth is devoted to the circulatory system.

In the eighth chapter we have an account of the nerves, and in the ninth of the brain. Here the authors introduce an account of the Amphibian brain to be studied in the frog,—that general "martyr of Science," as he has been called. Instructions are given for rapidly and painlessly killing these animals, which students might otherwise find no easy task. A comparison between the brains of the frog and of the cat is then instituted. The following recommendations for research are given:—"Numerous and careful preparations and drawings should be made of the brains of all Carnivora and monkeys, especially the young. The same should be done for peculiar fœtal and adult human brains. Between the ordinary Carnivora and the monkeys are two groups whose brains should be studied with especial care: the seals have a rudimentary post-cornu and occipital lobe, and these parts are said to be well developed in the lemurs, which have affinities with both the Carnivora and the Primates." It need scarcely be added that such researches are no less needed from a psychological than from a morphological point of view.

The eleventh chapter finally deals with the cranial nerves and the organs of sensation. There is also an Appendix, and a somewhat elaborate Bibliography.

So far we have felt great pleasure in examining this work. The authors are masters of their subject, and are earnestly desirous to explain every detail to the student, and to put him in the right track for conducting original research, which should be, in our opinion, the main object in the pursuit of Science.

The work has, however, another phase which to us is less satisfactory. The authors are anxious to introduce a new nomenclature, in which many intelligible and simple terms are to be replaced by new-coined Græco-Latinisms. The very title of the book, "Anatomical Technology," is a departure from common usage, and is therefore liable to be misunderstood. Under "Technology" the world understands the scientific principles of some trade, manufacture, or industrial art. Had we merely seen this book announced, without a sketch of the contents, we should not have had the slightest conception of its nature. We should have preferred some such title as "Anatomical Manipulations," or "Guide to Anatomical Practice."

As regards the new terminology, we think nothing can be a greater mistake than the multiplication of technical terms, especially in any portion of Biology. The great educational advantage of the Natural Sciences, as compared with Classical Studies, is that they draw off the attention from words to fasten it upon things. By the reckless multiplication of technicalities this advantage is more and more forfeited. But there is, as it appears to us, a further sin in Dr. Wilder's reformed nomenclature. Now that an increased and increasing number of persons, who are

unacquainted with the classical languages, are studying Biology, it seems strange indeed to make its technical language more and more unintelligible to all who are not classical scholars. It must further be remembered that no scientific terminology can become cosmopolitan. The German *savants*, following the lead of our old master Oken, are more and more discarding Græco-Latinisms. The French so modify their classical terminology that it becomes difficult of recognition. With the names of animal or vegetable species the case is different. As a rule they are to the man of Science mere labels by which to identify any particular species. As definitions or descriptions they are worthless. What, for instance, do we learn concerning the extinct *Moa* by giving it the name *Dinornis?* Neither its locality, its habits, nor its place among birds. The generic name *Moa*, being shorter, more euphonious, and not being the property of any civilised nation, is in every way peferable. From the names of the parts of animals we expect merely that they should be correct guides to identification. If this cannot be done for English speaking nations by means of English words, then, and not till then, it will be time to look elsewhere. But what gain in clearness, precision, convenience, there can be in saying *arthra* instead of joints, *dextral* and *sinistral* instead of right and left, &c., we must confess ourselves unable to see.

Longman's Magazine. No. 2, December, 1882. London: Longmans and Co.

As in the case of its predecessor a very considerable portion of this number falls outside our cognizance. "John Harrison, the Chronometer-Maker," tells us the old sad story of a meritorious and successful inventor whom the Government of the day strove in every possible manner to defraud of the reward he had fairly won.

"The Earth in Meteoric Shadow," by R. A. Proctor, is an exceedingly probable explanation of the spells of cold weather which occur with almost absolute regularity at certain times of the year. The most striking of these is the time from the 9th or 10th to the 14th of May. These days seem to have the especial mission of destroying our fruit-crops. These bad spells are traced both in the eastern and the western continents, and in the southern as well as in the northern hemisphere,—a circumstance which in itself is almost conclusive that the cause is of a cosmic order. Mr. Proctor's hypothesis is that at these times a considerable portion of the solar radiations is intercepted by a belt of meteors passing between the earth and the sun, though not, as

some have supposed, the meteors which make so striking a display in August and November.

Mr. Proctor's paper contains certain incisive references to his brother astronomers. He remarks that "Even so late as 1879 M. de Fonvielle, editor of 'La Nature,' presented it not as a doubtful theory, but (after the manner which is characteristic, and I cannot but think a characteristic defect, of French popular science-teaching) as a known fact, which his readers were to accept because he said it—*Je vous le dit*, Moi." This charge is by no means unfounded. Again, Mr. Proctor, referring to M. Guillemin and Mr. Lockyer (the editor of 'Nature'), says, "Yet here are two professed teachers of the general public—rather condescending teachers too—not only describe this impossible movement, but even endeavour to picture it."

"The Norway Fjords" is the title of a pleasantly written account of a ten-weeks' trip to the Norwegian coast, by Mr. J. A. Froude. As a matter of course we find here little in the way of scientific observation, but for all this there are passages well worthy our notice. The author tells us that his friend and travelling companion X. "was a sportsman, but a sportsman only as subsidiary to more rational occupations. He was going to Norway to catch Salmonidæ; not, however, to catch them only, but to study the varieties of that most complicated order of fish." We have here a rather strong admission on the part of a sportsman and a defender of sport! Mr. Froude notices concerning the people of Bergen that "For politics they care nothing, not supposing that on this road is any kind of salvation for them." They are wise; such an atmosphere would prove speedily fatal to our English speech-makers and ochlogogues. The author speaks of the "cleanness" of the houses, not noticing, perhaps, that the Norwegian spits more promiscuously than ever did the American. Had he gone onwards to the Loffodens, however, he would have found squalor such as is unknown in England.

The following passage is worth quoting as a proof of that old but still neglected truth—the impossibility of getting all men to think and feel alike. Says Mr. Froude:—"For lakes and mountains, however beautiful, the appetite becomes soon satiated. They please, but they cease to excite; and there is something artificial in the modern enthusiasm for landscapes. Velasquez or Rubens could appreciate a fine effect of scenery as well as Turner or Stansfield; but with them it was a framework, subordinate to some human interest in the centre of the picture. I suppose it is because man in these democratic days has for a time ceased to touch the imagination that our poets and artists are driven back upon rocks and rivers, and trees and skies; but the eclipse can only be temporary, and I confess, for myself, that, sublime as the fjords were, the saw-mills and farm-houses and fishing-boats, and the patient industrious people wresting a wholesome living out of that stern environment, affected me very much more nearly."

It would be idle to question if Mr. Froude really feels what he here says, but how he or anyone *can* feel thus is to us an insoluble problem. The modern enthusiasm for landscape seems to us perfectly natural, and rather a sun-rise than an eclipse. That in these days man has ceased to touch the imagination is because we live in an age of great dingy cities,—an age of over-population, of worry and bustle, from which solitude—broken only by the presence of intelligent friends—is a heavenly relief.

"The Ghost" and the "Lady's Walk" are striking proofs of a change in public taste. Forty years ago such productions would have been laughed out of countenance.

Hydrostatics, or Practical Mechanics. Part II. By J. T. Bottomley, F.R.S.E., F.C.S., &c. London and Glasgow: W. Collins, Sons, and Co., Limited.

The work before us forms one volume of "Collins's Science Series," and is intended as a sequel to the "Elementary Dynamics," by the same author. It is observed in the Preface that the two books follow closely the programme prescribed by the Science and Art Department for the subject of elementary theoretical mechanics, in which they form a complete course. Mr. Bottomley, however, has not absolutely confined himself to the subjects specified in the Directory of the Science and Art Department. He has included a consideration of Thermometry, and has given explanations on the height of the heterogeneous atmosphere, and an investigation of barometric formulæ. Finally come a body of questions, a considerable number of which, we are told, are "taken from recent Examination Papers of the Science and Art Department."

The author expresses himself with great clearness, and has given numerous well-executed cuts in illustration.

In making use of Chapter IX., which treats of the "height of the homogeneous atmosphere," the student may possibly be disposed to ask if the atmosphere at the height of 26,217 feet ceases to be homogeneous, and, if so, what is its composition at greater altitude? As far as we have been able to discover he will not find any reply to his question.

The author advocates the metric system of weights and measures in contrast to the British standards. But if, instead of the cubic inch, he would take the grain measure as a unit of volume, he would surely find the inconveniences of which he complains much reduced.

As exceptions to the rule that bodies expand uniformly as their temperature rises, and contract as it falls, Mr. Bottomley men-

tions water, and perhaps iron and bismuth. One other body at least may be added. Pure tin in the solid state floats upon melted tin just as ice does upon water, and the same is said, though with some degree of uncertainty, concerning zinc.

Among the questions we note one which may mislead or puzzle. On p. 140, No. 41, we read: -"A nugget weighs 45 grms. Its specific gravity is 5·87; that of the quartz is 6·49. How much gold does it contain? The specific gravity here ascribed to quartz must be either a clerical or a typographical error.

The Field Naturalist and Scientific Student. Nos. 6 and 7, November and December, 1882. Manchester: Abel Heywood and Son.

THESE two numbers contain a good store of interesting matter. In an extract from a work by Mr. J. A. Froude, here quoted, we find a strange statement concerning the violent thunderstorms of South Africa:—"To a white man, they say, there is no danger while he has a black at his side, the latter being the better conductor. When one is struck another must be immediately substituted."

Mr. P. Percival communicates a paper on the Devil's Coach-Horse (*Gœrius olens*), but he does not notice the good service which it renders to man by its raids upon earwigs, and by an occasional in-door visit in search of cockroaches and crickets.

Mr. Cuthbert Oxendale gives a description of a "Lancashire Gullery" on Pilling Moss, near Garstang, where about ten to twelve thousand of the black-headed gull (*Larus ridibundus*) live and increase under the protection of Lord Winmarleigh and Captain Bird, the owners of the adjoining estates. Well do they deserve protection, for they clear the fields of larvæ, &c., for miles around.

There is an interesting note on the intelligence of cats, taken from the "Manchester Guardian." The writer very justly says that this animal shows "a power which can only be distinguished from reason by a process of verbal refining which is almost puerile.

A Mr. Brierley, in reply to a question put by a "North Lincolnshire Vicar," states that he never heard of a robin being killed by its own young.

Hylo-Idealism, or the Egoistic Theory of Mind and Matter. By R. LEWINS, M.D.

OUR attention has been called to the above paper, which appears in the "Secular Review," especially as it is a kind of summing up of ideas which first appeared in our pages under the title "Hylo-Phenomenonalism the Summa Scientiæ." The author's views, as here expressed, border very closely upon those of the mediæval nominalists, Abelard and Occam, the difference being simply the outcome of the advances made in Science since the thirteenth century.

Dr. Lewins hopes that his views may ultimately prove an Eirenicon, reconciling the scientific and the poetic interpretations of Nature, and finally eliminating all ontological tendencies. However this may be, it cannot be other than wholesome for the public to be reminded of the assumption underlying all Science. We know that our sensations of colour, form, sound, odour, &c., are merely impressions, *i.e.*, changes in our own mind. We postulate these changes as due to and as corresponding with the existence and the changes in an external world. But both in scientific research and in the practice of daily life we forget too often that all this is an assumption which—be it truth or error—is incapable of demonstration.

Was John Bunyan a Gipsy? By JAMES SIMSON. New York: James Miller. Edinburgh: Maclachlan and Stewart.

WE received some time ago a pamphlet by the same author, on the same subject, and pronounced it as entirely outside our competence. We can merely repeat that the nationality of John Bunyan does not concern the "Journal of Science."

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

EXAMINERS AND THEIR SHORTCOMINGS.

To the Editor of the Journal of Science.

SIR,—You have lately given the world some interesting information on the methods employed by "coaches" in preparing their men. Perhaps you will grant me a corner of your space to communicate, from my own experience and that of my late fellow-students, some facts concerning examiners. I find that wherever the examination is *viva voce*, and where a single student is called up at a time, success or failure very much turns on chance.

Suppose the examiner knows the candidate or his family, he will often chat with him on indifferent matters, and then just put a few questions in a perfunctory sort of way. If a candidate has been up before, and been plucked, the examiner is always doubly severe. I was asked by each examiner in turn "Have you been up before?"

Sometimes an examiner takes a dislike to the looks of a candidate, and treats him to the hardest and most unreasonable questions he can select.

Some examiners, most unfairly and unjustly, try to unnerve and bewilder a student. On receiving a right answer they will put on a look of contemptuous surprise, and in various ways bully and insult their victim. In this manner they find pretexts for rejecting the timid and the hot-tempered, whatever may be their talents and attainments.

I think it will be admitted by all right-minded men that if our present examination system is to continue it should be administered with absolute fairness and impartiality.

I had nearly forgotten that in case of lady candidates there is a display of effusive gallantry, and every point is stretched to

"pass" them. I know well that many students unquestionably my superiors have been rejected, whilst I have the good fortune to subscribe myself—

"ONE WHO HAS PASSED."

[We shall be very happy to hear further details from this correspondent.—ED. J. S.]

THE FOG QUESTION.

To the Editor of the Journal of Science.

SIR,—In an otherwise able article on the fog-nuisance I was surprised and shocked to read the following sentence:—"The vast majority continue, with mingled stupidity and selfishness, to build up fires of bituminous coal, and as the law compels factories, but not householders, to consume their own smoke, few houses fail to contribute something to the vast pall which perpetually hangs over London." Surely the writer of the article knows, or might know, that at least two-thirds of the householders of London cannot raise the money which the introduction of smoke-consuming stoves in their houses would cost. Further, if they could lay down (say) £5 per room, their landlords would not permit the alteration without an undertaking to restore the ordinary stoves at the conclusion of the tenancy, when, I suppose, the tenant is to go and repeat the expenditure in his new dwelling. If, without altering our fire-grates, we are all to use anthracite, what will be the price of this kind of fuel, brought as it is on one only line of railway and without sea-competition? The writer in question reminds me of a French princess of the olden time, who advised the poor to eat pie-crust in default of bread.—I am, &c.,

"STUPID AND SELFISH."

PUBLIC IGNORANCE AND QUACK INGENUITY.

To the Editor of the Journal of Science.

SIR,—A quack who has his head-quarters near Westminster Bridge has an ingenious method of beguiling the public. He tells his hearers that if a person affected with incipient consumption blows through a glass tube into water it will at once turn milky, and invites them to make the trial. As the liquid which he offers is lime-water, the result follows as a matter of course. He then adds a few drops of his medicine (containing some acid) to the water, when the cloudiness at once disappears. This he argues is a proof that the same remedy will eradicate consumption from the human system. Multitudes of those present believe him, and buy his secret remedy.—I am, &c.,

A STUDENT.

REPLY TO "TRUTH SEEKER."

YOUR letter anent Mr. Tennyson does not fall within our competence. We admit that he is no friend of Science, but we cannot, on that sole ground, defend every person and every thing he may attack. If he has libelled Medicine and Free-Thought, both have established organs and writers competent to take up their respective causes.

THE EDITOR OF THE JOURNAL OF SCIENCE.

NOTES.

The Royal College of Science and South Kensington.—We quote the following letter from the "Freeman's Journal," and we trust that some Irish member will take the advice of our esteemed friend and contributor, Professor R. Galloway:—

"47, Leeson Park, November 21st.

"SIR,—The Lord Mayor desires decentralisation as regards Irish institutions. Allow me to state two facts, out of many, to show the desirability for this change. The Department of Science and Art at South Kensington governs, as most of your readers know, the Royal College of Science in Stephen's Green; that College costs the taxpayers as much as one of the Queen's colleges. Last session (1881-82) the Professor of Botany and the Professor of Zoology had one solitary paid student between them. Two scholarships are given away at the end of each session. Last session there were only two students for the two scholarships, and there would not have been two except that one had been sent over from England.

"If any Irish member would move for and obtain a Parliamentary inquiry into that institution, the facts that would be revealed would be so astounding that it would result, I feel certain, in the decentralisation both of that and the other Government institution in Kildare Street.—I am, Sir,

"ROBERT GALLOWAY."

Professor S. Thompson points out the little-known fact that Swammerdam anticipated the famous initial experiment of Galvani by more than a hundred years. Being on a visit in Tuscany, in 1678, the illustrious Dutch naturalist showed to the Grand Duke that when a portion of muscle of a frog's leg hanging by a thread of nerve bound with silver wire was held over a copper support so that both nerve and wire touched the copper, the muscle immediately contracted.

The Rev. L. J. Templin ("Kansas Review of Science") makes some remarkable comments on the "wastes of Nature," both in the organic and in the inorganic world.

Mr. Merrick, in an elaborate memoir sent to the Entomological Society, contends that the distribution of the Tortricidæ points to the former existence of a great southern continent, by which Australia, Africa, and South America were connected at an early epoch. He strongly condemns the present classification

of the Micro-Lepidoptera, and insists upon a more general and careful study of the neuration of the wings.

In South Africa a bitter hostility prevails between the dogs belonging to the Aborigines and those of the European settlers, whether Dutch or English. If a straggler of either kind falls in with a number of the other he rarely escapes with his life.

Now the question of "thought-reading" is receiving the attention of many thinkers, the following incident recorded in "Men of the Time" may be worth notice:—"As Louis Blanc was returning home one evening in October, 1839, he was suddenly assailed from behind by some ruffian, who inflicted a violent blow with a stick on his right eye. The author of this cowardly attempt—which was made the day after M. Louis Blanc had published a review of Louis Bonaparte's work, 'Les Idées Napoleoniennes'—was never discovered. M. Louis Blanc had a brother one year younger than himself, who was at that time at Rodez, in the department of l'Aveyron, and who entertained so strong a conviction that his brother was being assaulted at the precise moment when it really occurred that he was induced to write at once for information to Paris. This incident was the origin of M. Dumas's 'Corsican Brothers,' the main subject of which is the preternatural sympathy between two brothers." It may be mentioned that the death of Louis Blanc followed that of his brother with very little interval.

The Bishop of Manchester in a harvest thanksgiving sermon, is reported to have said:—"There was a progress of science which was causing very serious apprehensions in the minds of many, and not altogether without cause, for as yet the tendency of science could hardly be said to be determined, and we did not know whether it was going to take up a direct antagonistic position to religion and morality or not? Was science going to be atheistic? Some of its professors, no doubt, assumed that attitude. It was distinctly assumed by Haeckel and Büchner, and perhaps by a few nearer home, and he was sorry to see that hasty letter of Charles Darwin, written when he was ill, and, perhaps, hardly capable of fixing his mind on the question, which might seem to shake men's faith in a revelation and a life beyond the grave."

According to "Les Mondes," English soldiers rank among the worst fed in Europe. The daily ration of a Swiss soldier is 1062 grms. of solid food; that of a Russian, 1019 grms. About the middle of the scale comes Belgium, 770 grms. Then follow England, 672 grms.; France, 661 grms., and Italy, 637 grms.!

According to Prof. F. Bauher (Vienna Academy of Sciences), the thorax of the Hymenoptera is composed of three ordinary rings. In the Diptera the dorsal side of the first abdominal ring is reduced to one-half, and is attached to the second abdominal

ring, which it resembles. The thorax of the Diptera is constructed like that of the Lepidoptera, though the latter have a mesophragma divided longitudinally, and the former an entire diaphragm.

Prof. A. Lacassagne ("Revue Scientifique") gives an assay on "Criminality in Animals" which coincides very closely with our article on "Animal Depravity" ("Journal of Science," 1875, p. 415).

M. Millet, in a paper read before the Société d'Acclimatation, gives some interesting particulars concerning the stork. The male arrives first to take possession of the old nest, and the female follows some days later. If frost or damp is expected the male covers his brooding mate with dry grass. The number of young brought out is generally five. The stork arrives in France on an average about March 24th, and leaves about August 12th.

Attempts are being made to acclimatise in France *Pucrasia macrolopha*, a bird nearly allied to the true pheasants, but surpassing them in the quality of its flesh.

Mr. F. Cope Whitehouse makes the startling assertion that Fingal's Cave is probably an artificial excavation. His arguments are entitled to serious consideration.

Mr. Horatio Hale, in a paper read at the late meeting of the American Association for the Advancement of Science, suggests that the Red Indians of America were originally immigrants from Europe.

According to the "Popular Science Monthly," "the degree of barbarism in any community is measured by the impunity with which its members seek their gratification at each other's expense." This is a home-thrust for dog owners.

Messrs. Mawson and Swan have made a small accumulator weighing about five pounds, which is capable of working one lamp continuously for two hours when fully charged, or for a much longer time by turning off the light when not wanted. Irrespective of the use of the electric lamp for illuminating purposes, in combination with very sensitive dry plates, it be all that is required for the taking of micro-photographs.

At a recent conversazione of the Royal Microscopical Society, an adaptation of the incandescent light was exhibited by Messrs. Mawson and Swan, of Newcastle. The carbon loop was enclosed in a very small tube, which enabled the light to be brought quite close to an opaque object, which was thus illuminated without any assistance from a condensing lens. On another microscope the light was placed close beneath the object, and was attached to a simple contrivance, which enabled it to be rotated eccentrically to the axis of microscope: in this case a

high power, 1-12th in., was employed, and the effect with *Pleurosigma formosum* was very good. Some experiments were tried with the ordinary condensing lens on opaque objects with good results, and when electricity can be more conveniently obtained the lamp will no doubt be used to a great extent. The source of power in this instance was a series of Bunsen cells.

M. Jousset de Bellesme, a Professor at the School of Medicine, at Nantes, was about to deliver at the commencement of the college session a discourse entitled "Reminiscences of Claude Bernard," but was formally prohibited from so doing by M. Duvaux, the Minister of Public Instruction. The liberty of thought and speech is therefore not established in the French Republic. The most daring utterances in this discourse are:—"He (Claude Bernard), amidst the almost general decay of French science, the fruit of *official centralisation*, has for a moment made other nations forget the alarming distance they have put between themselves and us"; and "There are no stakes and fagots in our days, but there is the Academy. We are not afraid of being burnt alive, but of not being elected an Academician."

The latest "refuter" of Darwinism is one C. M. Renooz. He contends that man is the product of the Evolution not of animals, but of plants.

M. W. D. Le Sueur ("Popular Science Monthly"), in reviewing Mr. Goldwin Smith's critique on Mr. Spencer's "Data of Ethics," pertinently remarks that "with a strange inconsistency the partisans of a supernatural view of disease are always ready to apply themselves most vigorously to abating by natural means the chastisements which they say are meant for their good."

According to H. Cl. Zimmermann the atomic weight of uranium must be assumed = 240.

M. Rey de Morande seeks to explain the retreat of vegetation from the Polar regions by the gradual decrease in the diameter of the sun, which was once large enough to irradiate simultaneously both the terrestrial poles.

The new National Museum at Dublin, if built upon the plans drawn out by Mr. J. L. Robinson, will be a splendid and commodious edifice, affording ample space for the National Library, and suitable rooms for the Royal Irish Academy and other scientific bodies.

Dr. J. Burdon Sanderson, F.R.S., has been appointed to the new (Wayneflete) chair of Physiology at the University of Oxford.

Mr. H. D. Valin accounts for the formation of prairies to the west of the Mississippi by the supposition that they represent

ground which has always been inundated or subject to periodical inundations. They rest generally on Silurian rocks.

The Aurora Borealis of November 17th is reported as having been observed over a great part of Europe, and as having been accompanied by striking electric and magnetic disturbances.

M. G. Calmels ("Comptes Rendus") has studied and described the poison-glands which are found in the skin of the upper surface of the trunk and the limbs of the toad. The skin-glands of the lower surface do not secrete poison.

M. E. Dauwe, of Maldeghem, near Bruges, observed a lunar rainbow on October 29th last.

Mr. G. S. Gardner, F.G.S. ("Geological Magazine") challenges the generally accepted theory of the permanence of oceans and continents on the faith of facts connected with the distribution of plants and of land-mollusks.

The "Gardeners' Chronicle" gives an interesting account of the effects of the stinging tree, *Laportea gigas*. The pain produced by the sting of a single hair on the right hand gave rise to remarkable symptoms, the pain being confined to the right side of the body and being succeeded by a numbness and slight paralysis. Besides the pain, a sensation of losing the senses, or rather of becoming insane, was experienced. The severe symptoms lasted two hours; the spot pricked remaining constantly painful for nearly a month after being stung. There is here scope for research, both chemical and physiological,—the latter of course not in this "free" and favoured country.

M. Beketoff, a Russian sanitarian, has come forward as the advocate of a vegetarian diet. He maintains that, even in Australia, the number of cattle tends to decrease daily.

"Les Mondes" claims explicitly the discovery of the pulmonary circulation of the blood for Andrea Cesalpino.

Dr. O. Loew ("Archiv. f. d. ges. Physiologie") concludes, from a series of recent investigations, that the unformed ferments have not been proved in any case to be other than albumenoids. The peptic and amylolytic ferment of the pancreas, and also the diastase of malt, are albumenoids of the peptone character, and agree in this respect with the papaine of Wurtz.

According to E. L. Larkin ("Observatory"), on the 16th of April last there occurred simultaneously a magnetic storm, an aurora of unusual splendour, and an extraordinary agitation in the sun, 111 spots having been counted during the day.

At the December meeting of the Entomological Society there was exhibited a supposed viviparous moth (*Tinea*), sent by Dr.

F. Müller, of Santa Caterina, Brazil. This is the second known instance of viviparity among the Lepidoptera.

At the same meeting was exhibited a fig-insect (*Cynips*), received by Sir Sidney Saunders from Madagascar. In this species the intermediate pair of legs is wanting, being represented merely by a pair of rudimentary lobes.

J. Reinke ("Pfluger's Archiv.") concludes that there are no galvanic currents circulating in the living vegetable cell. This is in opposition to the view of Velten.

According to Pflug ("Centralblatt Med. Wissensch.") pulmonary disease with the formation of tubercle is occasioned by microscopic *Actinomyces*.

Prof. Just shows that the green parts of plants under the influence of sunlight have not the power of decomposing carbonic oxide (carbon monoxide). On the contrary this gas has an injurious effect upon plants, though less decidedly than upon animals.

H. Struckmann ("Archiv. f. Anthropologie") gives an interesting account of the fossil bones in the "Rhinoceros Cavern," at Scharzfeld, in the Harz. It contains the remains of three distinct and successive Faunæ.

By an oversight we omitted to notice in our last issue the death of the eminent meteorologist and seismologist, Prof. Palmieri.

Prof. Kolbe has proved experimentally that beef, kept in an atmosphere of carbonic acid, remains sound and of a natural flavour for some weeks. Mutton, treated in the same manner, becomes offensive in about eight days.

In addition to MM. Faye and Hirn, Dr. D. Tommasi takes objections to the theory of Mr. Siemens on the conservation of the solar energy.

Mr. St. George Stock pronounces spiritualism to be "the apotheosis of evolution."

The Home Secretary has, by various orders under his hand, altered the close time for wild birds in the following counties and districts:—Huntingdonshire, Liberty of Peterborough, and Isle of Ely (in Cambridgeshire), so as to be from the 15th of March to the 31st of August, both dates inclusive; Essex so as to be from the 15th of March to the 1st of August, both inclusive. The statutory close time is from the 1st of March to the 1st of August. These orders will permanently supersede temporary orders to the same effect, for one year only, made last year.